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Volatile Organic Compound Emission Projection Model (Version 1.8). User's Manual

Radian Corp., Research Triangle Park, NC

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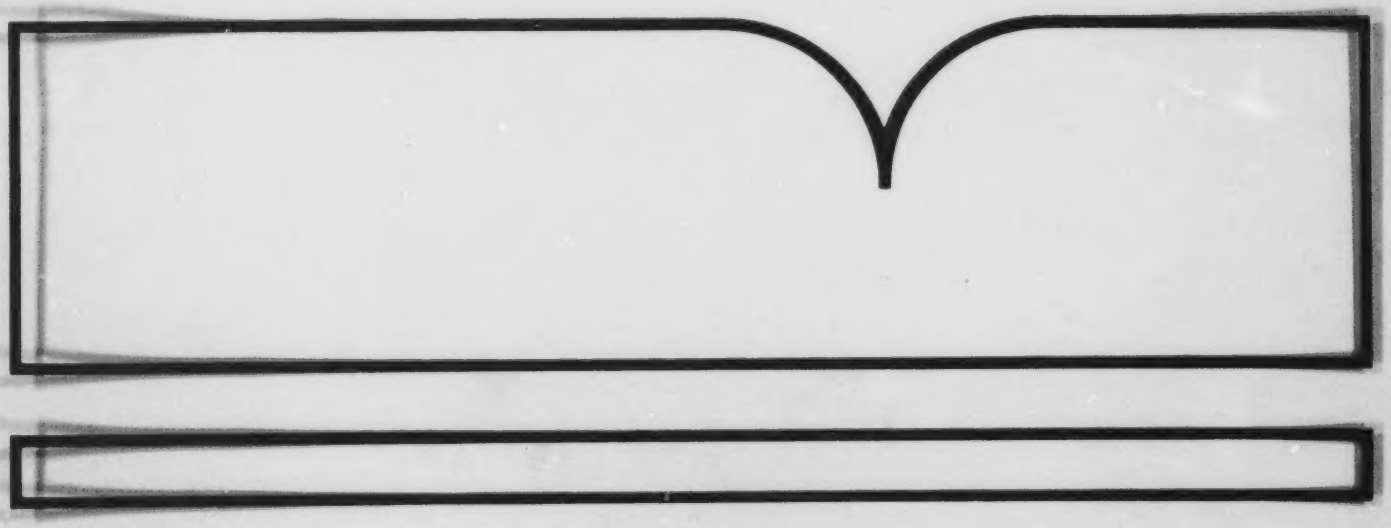

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16. ABSTRACT The report discusses a model that can be used to estimate future emissions of volatile organic compounds (VOCs) and costs of their control by applying growth factors, emission constraints, control cost functions, and capacity retirement rates to the base line estimates of VOC emissions and industrial VOC source capacity in 1980. A personal computer model has been developed to automate this forecasting procedure. The report provides guidelines for installing and operating the Volatile Organic Compound Model (VOCM) on an IBM-PC or IBM compatible computer. The report describes the creation of data files by a VOCM user and the use of data files supplied with the VOCM for preparing forecasts.

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THE VOLATILE ORGANIC COMPOUND EMISSION PROJECTION MODEL USER'S MANUAL (VERSION 1.8)

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ABSTRACT

Future emissions of Volatile Organic Compounds (VOCs) and costs of their control can be estimated by applying growth factors, emission constraints, control cost functions, and capacity retirement rates to the base line estimates of VOC emissions and industrial VOC source capacity in 1980. A personal computer model has been developed by the U.S. EPA to automate this forecasting procedure. This report provides guidelines for installing and operating the Volatile Organic Compound Model (VOCM) on an IBM-PC or IBM-PC compatible computer. The report describes how a VOCM user can create his own data files or use those supplied with VOCM for preparing forecasts.

NOTICE

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Chapter 1
INTRODUCTION

USING THIS MANUAL

This manual explains how to use the Volatile Organic Compound Emission Projection Model (hereafter called VOCM). The manual provides guidance to the VOCM user that is familiar with the IBM-PC Disk Operating System (DOS) and can perform such DOS operations as formatting disks, copying or deleting files, and creating sub-directories. Users not familiar with these procedures should review the DOS Operating Manual before installing and operating VOCM.[1]

The manual consists of five chapters and three appendices as outlined below:

Chapter 1 (INTRODUCTION) is a brief introduction to VOCM. It explains VOCM's function and describes various features.

Chapter 2 (VOCM PROGRAM OVERVIEW) presents a general explanation of how VOCM works and explains its basic operation. It also defines some terms the VOCM user should know.

Chapter 3 (GETTING STARTED) describes how to install and operate VOCM on your PC. It also explains how to configure your PC and VOCM, and the fundamentals of operating VOCM.

Chapter 4 (ENTERING INPUT DATA) describes how to provide VOCM with the data it uses in making a projection. VOCM's Sheet Editor and an import feature for data entry are both explained.

Chapter 5 (RUNNING A PROJECTION) explains how to run a VOCM projection. An example of a projection with example data input is described.

Appendix A (VOCM'S DATA FILE SHEETS) provides detailed descriptions of all the fields in VOCM's data file sheets. Until you become familiar with the data file sheets, you may want to have the manual open to this appendix as you enter data into the sheets.

Appendix B (VOCM'S OUTPUT) provides samples of VOCM's output and a detailed description of the what this output contains.

Appendix C (DATA LIMITS) lists VOCM's upper limits with respect to the amount of data it can handle and the complexity of analyses it can perform.

WHAT IS VOCM?

The Volatile Organic Compound Emission Projection Model (VOCM) is a computer program that can model the effect of industrial growth and constraints (such as environmental control regulations) on future emissions. This manual provides guidance on the operation of VOCM Version 1.8. Subsequent versions that do not differ substantially from Version 1.8 will be documented with supplementary technical notes which will be included on the VOCM distribution disks.

VOCM Version 1.8 is supplied with data bases developed from the National Acid Precipitation Program's (NAPAP's) 1980 Emission Inventory (Version 3.0).[2] Thus, 1980 is the base year from which the model projects future year emissions when using these data bases. It is anticipated that updated versions of VOCM data bases will be made available after a 1985 NAPAP Emission Inventory is produced by EPA. The model software itself is not specific to the 1980 base year and no software changes are required to work with data bases with different base years.

VOCM operates by projecting the emissions existing in a particular year (1980 when using data bases supplied with Version 1.8) into the future, then reducing the projected emissions to levels required by the applicable constraints. It can also estimate the cost of controlling emissions to the required levels. The program is designed to be used on the IBM-PC family of computers (principally the XT and AT series) and 100 percent IBM compatible computers. A hard disk and at least 640 K-Bytes of memory are strongly recommended for efficient use of VOCM.

MAJOR FEATURES OF VOCM

VOCM offers the following features and capabilities:

* It can project emissions for up to 70 years in the future (i.e., beyond the base year of the emissions).

* It can project emissions from as many as 1000 industrial categories in up to 50 geographic regions.

* It can project emissions from sources existing in the base year and from new/replaced sources that are built during the projection period.

* It allows the user to specify growth rates that are specific to a particular industry in a particular region. The growth rates can change during the projection period.

* It allows the user to apportion growth (new emissions) between attainment and non-attainment areas.

* It can model the effect of up to 500 regulatory and other emission constraints. Each constraint can apply to any combination of regions and industrial categories. Each constraint can apply to: 1) sources existing at the time the constraint takes effect, 2) sources that are new/replaced after the constraint takes effect, or 3) both.

* It allows the modeling of offset constraints where new/replaced emissions are required to obtain offsets above and beyond their controlled emissions. This is useful for analyses involving new growth in non-attainment areas.

* It allows the modeling of emission rollbacks for any region. A rollback provides a way of establishing an emission ceiling expressed as a fraction of the projected emissions in any specified year.

* It can determine the costs of controlling the projected emissions to meet the applicable constraints.

* It can perform projections for all regions and industrial categories in the data base, or for only certain ones that the user specifies.

* It can run projections for more than one year at a time.

* It allows the user to import emissions and growth data from standard text files. This assists in developing large data bases developed on other computers and/or developed with other programs.

* It allows the user to aggregate the projection results into categories broader than the industrial categories used in the projection.

REFERENCES FOR CHAPTER 1

1. Disk Operating System Version 3.10. International Business Machines Corporation, Boca Raton, FL, February 1985.

2. Status Report on the Development of the NAPAP Emission Inventory for the 1980 Base Year and Summary of Preliminary Data. EPA-600/7-84-091, (NTIS PB85-167930), Prepared by Engineering-Science Corporation for U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards and Office of Research and Development, Research Triangle Park, NC, December 1984.

Chapter 2
VOCM PROGRAM OVERVIEW

This chapter explains the general operation of VOCM and describes some of its main operating features. Definitions of some of the terms the VOCM user should be familiar with are also presented.

HOW VOCM WORKS

VOCM models the growth of emissions from industrial categories in geographic regions over a specified period of time. It then applies constraints to the emissions existing at the end of this period. It sums the constrained emissions from all industrial categories and all regions to produce a projection of total constrained emissions. When requested to do so, VOCM also computes the costs associated with controlling the emissions to comply with the constraints.

The user must provide VOCM with the data (e.g., emission data, growth rates, constraint information, costs, etc.) to use in the projection. VOCM users may specify their own data files or use those supplied with the model. These files may be modified by the user, or completely new files may be generated by entering data into VOCM's data files using VOCM's built in data entry system. The projection results are output to a printer or disk file.

VOCM is designed to be flexible. The emission data you provide can be for as many as 1000 industrial categories in as many as 50 geographic regions. Up to 500 individual constraints can be defined. Each constraint can apply to any combination of regions and industrial categories. Up to 150 cost tables relating control cost effectiveness and control efficiency can be defined by industrial category.

BASIC OPERATION

Running the VOCM program basically involves three steps:

1. Entering global parameters for the analysis: You enter information about defaults, your computer hardware, what output you desire, and other general information that globally affects the projection.

2. Entering/editing the input data: You enter the input data into VOCM's data files either by typing the data into forms, called "sheets," that are displayed on the computer screen, or by typing the data into standard ASCII (American Standard Code for Information Interchange) text files and then having VOCM import the data into its data files. Version 1.8 of VOCM supports the importation of ASCII text files for emissions and growth data files only.

2. Running the projection: You tell VOCM the projection year, the regions, and the industrial categories you want to be included in the forecast. The projection is then started.

To perform these steps you select from VOCM's Main Menu which is displayed when you first start VOCM. The Main Menu is shown in Figure 2-1. VOCM prompts you to enter the number for the operation you want to perform. The first menu selection allows you to change the overall global parameters for a run. The second menu selection is used to enter data into the input data files. (If you wish to import data from text files, you use the third menu selection.) You then start the projection by selecting Item 4 (Run Projection) at the Main Menu. You will then be asked for additional information on the projection year, regions, and industrial categories to be included in the projection. VOCM then starts the projection.

OPERATING FEATURES

Some of VOCM's special operating features are summarized in this section.

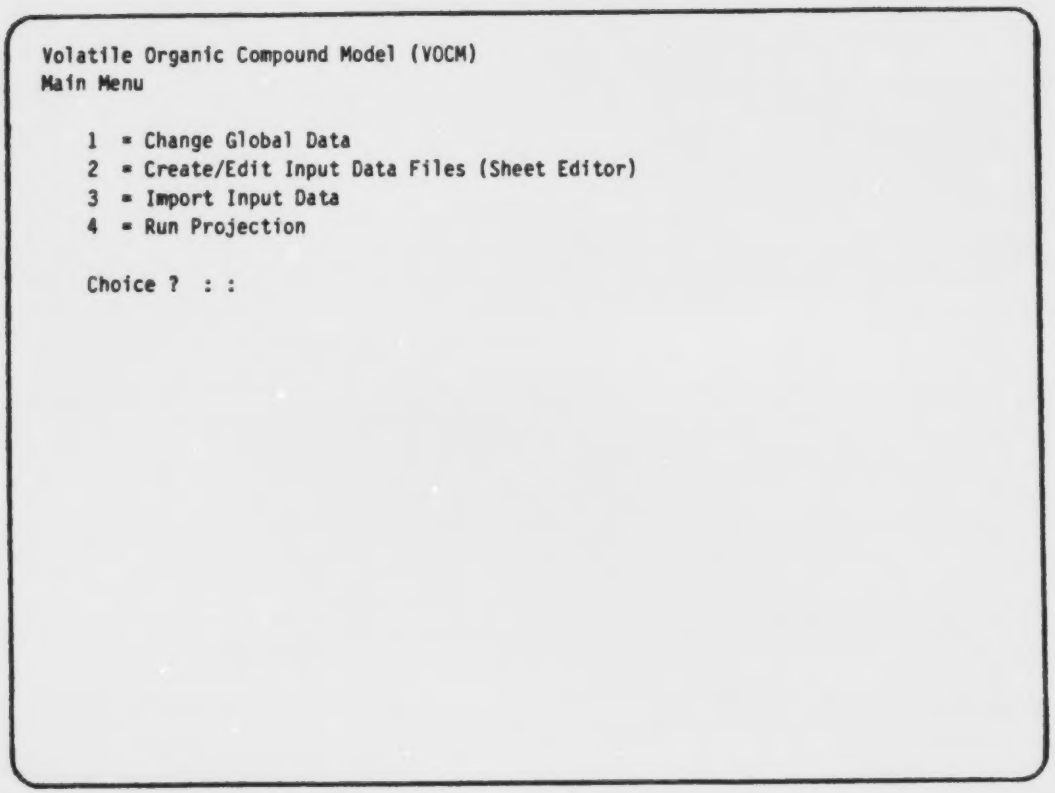

Volatile Organic Compound Model (VOCM)
Main Menu
1 = Change Global Data
2 = Create/Edit Input Data Files (Sheet Editor)
3 = Import Input Data
4 = Run Projection
Choice ? : :

Figure 2-1. VOCM's Main Menu.

The Sheet Editor

VOCM possesses a special data-entry system called the Sheet Editor. It provides a simple and straightforward way to enter data into VOCM's data files.

The Import Feature

VOCM provides a way for you to "import" emissions or growth data to VOCM's data files. With the import feature, you can have VOCM transfer entire files of data into VOCM's data files, instead of having to type the data into the files using the Sheet Editor. This feature is useful if you wish to transfer data to VOCM from other energy/economic forecast data bases or if you prefer to work with a word processor to organize data base files rather than use VOCM's Sheet Editor.

Region and Industrial Category Identifiers

VOCM uses 10-character (or less) identifiers (IDs) for regions and industrial categories. This allows you to use descriptive names and/or hierarchical numbering systems. For example, if VOCM is used to project state-level emissions for industrial categories defined by EPA Standard Classification Codes (SCCs), you can use state names and the SCC numbers to identify regions and industrial categories, respectively. In addition, VOCM supports a "wild card" feature that allows a single ID to indicate a group of IDs. For example, a constraint may be identified as applying to all industrial categories having an ID beginning with the number "301" by entering the wild card ID "301???????".

Constraint Flexibility

VOCM allows you to define up to 500 constraints. Each constraint can apply to very specific or very general subsets of emissions. You specify the regions and industrial categories to which a constraint applies, and whether the constraint applies to existing and/or new/replaced emissions. VOCM is extremely

rigorous in determining what constraints apply to what emissions. VOCM keeps track of when new/replaced emissions come on-line with respect to each constraint. It uses this information to divide emissions into different subsets (called "segments"), each with different constraint applicability. If more than one constraint applies to a given segment of emissions, VOCM automatically selects the most stringent.

DEFINITION OF TERMS

This section defines some terms you should be familiar with in order to use VOCM and interpret its output. For a better understanding of some of the terms, refer to Appendices A ("VOCM's Data File Sheets") and B ("VOCM's Output").

Constraint	A limit on emissions. In most cases, the constraint will be a regulatory limit such as a New Source Performance Standard (NSPS) or a state standard mandated by a State Implementation Plan (SIP).
Constraint Beginning Year	The year when a constraint takes initial effect.
Constraint Target Year	The year when a constraint takes full effect.
Region	Typically a geographic area, such as a state, but any entity having emissions can be defined as a region.
Industrial Category	Typically a set of related emission-generating processes, but any entity having emis-

	sions can be defined as an industrial category.
Base Year	The base year of the emissions data that will be projected into the future. (This is the year of the emissions data in the emissions data file.)
Projection Year	The year in the future for which emissions are projected.
Projection Period	The period from the base year to the projection year.
Sector	A single industrial category in a single region. VOCM's performs projections sector by sector during an analysis.
Sector Growth Rate	The growth rate for a single industrial category in a single region.
Segment	A subset of emissions that is subject to a unique set of constraints. Segments are formed due to the timing of constraints with respect to when emissions are built or retired.
Penetration	The percentage of an industrial category subject to a particular regulatory constraint on emissions.

Chapter 3
GETTING STARTED

This chapter discusses the information you need to get VOCM up and running on your computer. You should read this chapter before trying to run VOCM.

WHAT YOU NEED TO RUN VOCM

To run VOCM you need the following:

* An IBM-PC computer (or 100 percent IBM-PC compatible computer) having two floppy disk drives or a hard disk. If you intend to run VOCM for complex problems with large input data files, you will probably need a hard disk to get acceptable performance. VOCM does not need a numerics co-processor; although it will run faster if the computer has one.

* The amount of random access memory (RAM) required depends on the complexity of the projections you will be running. For simple projections (i.e., those involving relatively few constraints, cost tables, regions, and industrial categories), 320 K-Bytes (K) will usually be enough. For more complex projections, 512K will generally be adequate. Extremely complex projections may require the maximum amount of memory (640K) that can be accessed by programs running under the PC-DOS operating system. Keep in mind that memory resident utilities (e.g., SideKick), print spoolers, RAM disks, and other memory resident software may reduce the amount of memory available to VOCM. The amount of memory available to any program can be determined by using the CHKDSK program provided with PC-DOS (see your DOS manual).

* PC-DOS (or MS-DOS) Version 2.0 or higher. Version 3.1 or higher of PC-DOS is preferred.

* Blank, formatted, floppy diskettes to store the data files for floppy disk systems or to back up the data files for hard disk systems.

* A printer to print the results. The printer must be capable of printing up tc 131 columns. VOCM automatically toggles IBM/Epson dot-matrix printers into their compressed printing modes which enables the narrow carriage models to print 131 columns. (VOCM has an option to print results to a disk file rather than a printer; if you use this option exclusively, you can run VOCM without a printer.)

* The VOCM program and support files, preferably installed on a hard disk for faster operation of the model.

CONFIGURATION FILE

Your PC should have a system configuration file (CONFIG.SYS) on the root directory of the disk used to start your computer (typically the root directory of the hard disk for systems with hard disks). Refer to your DOS reference manual for instructions on how to create this file if one does not currently exist on your computer. Secondly, check the file to determine its contents. For complex VOCM runs, a system configuration file with the following lines is recommended:

```
BREAK=ON
FILES=20
BUFFERS=50
```

The file on your PC is acceptable for operating VOCM if the file and buffer capacities specified are equal to or greater than the values shown above. With the default directory set to the root directory, this file can be inspected at the DOS prompt by typing "TYPE CONFIG.SYS". A text or line editor can be used to modify this file. Please note that you must restart your computer (by pressing Ctrl-Alt-Del simultaneously) in order for changes to your CONFIG.SYS file to take effect.

VOCM FILE MANAGEMENT

Before installing or operating VOCM on a computer, you should make a backup copy of the programs and data files on the distribution disks. Use the DOS COPY command or DISKCOPY command to make copies of the files on the distribution disks. See your DOS manual if you are not familiar with these commands.

The VOCM model consists of three program files and eight data files. The three program files are:

VOCM.EXE	This is the executable program compiled from the VOCM source code.
DKIX.BCI,DKFF.BCI	These two files contain the screen images of the sheets used for entering data.

For floppy disk systems, these three files should always be kept on the diskette in the default directory and this disk should be left in the disk drive throughout the time the program is running. If you are using a hard disk system, you should keep these three files on the default directory of the hard disk. If you are unfamiliar with directories and how to change default directories, consult your DOS manual.

In addition to the three files described above, VOCM uses eight data files for storing the data used in a projection. The data files supplied with the model are based on research by Radian Corporation, compilation of information from the literature (principally U.S. EPA background documents prepared in support of regulatory programs), compilation of data from the 1980 NAPAP Emission Inventory, and growth data supplied to NAPAP by Argonne National Laboratory (ANL). The ANL growth data are based upon projections from the draft National Energy Policy Plan (1985). These data bases provide a comprehensive set of inputs for VOCM. However, the user may substitute other values as may be appropriate for a particular analysis by modifying existing

files or creating entirely new files for one or more of these data bases.

General descriptions of the data files are given below. Detailed descriptions of the information contained in these files are given in Appendix A, "VOCM's Data File Sheets".

GLOBAL.DAT	This file contains system-wide information such as default values, hardware identifiers, and output specifications.
EMIS.DAT	This file contains the base year emissions data.
CONSTRNT.DAT	This file contains information about constraints that limit emissions.
GROWTH.DAT	This file contains the growth rates for each industrial category in each region.
RETIRE.DAT	This file contains the retirement rates for each industrial category.
COST.DAT	This file contains control cost data.
AGG.DAT	This file contains a listing of the industrial categories for which you want the projection results aggregated.
ROLLOFF.DAT	This file contains information about rollback emission levels and offset emission levels for each region.

The GLOBAL.DAT file must be kept in the default directory along with the program and support files. The remaining data files do not need to be kept on the default directory. They can

be located on another disk drive which you specify in the GLOBAL.DAT file.

If you are using a floppy disk system, you will probably want to keep the data files in the second disk drive (typically Drive B). You tell VOCM the location of the data files by specifying the data disk drive identifier in the GLOBAL.DAT file. However, most floppy disk systems are equipped with disk drives that provide for only 360K of storage per diskette. If you wish to use the supplied data files, you will not be able to fit all the data files on a single data diskette. Instead, you will need to split the eleven files between two floppy disks. This method of operating VOCM is more arduous since certain rules must be adhered to in configuring the disks and disk swapping in and out of the drives are necessary during VOCM's operation.

When splitting the files between separate floppy disks, place the three program files and the GLOBAL.DAT file on the first disk. This disk should be placed in the default disk drive (e.g., Drive A). The remaining data files should be placed on additional disks that are swapped in and out of the second disk drive (e.g., Drive B) when the user is prompted by the model. Place the EMIS.DAT and GROWTH.DAT data files on the same floppy disk since they are read repeatedly while a projection is being run. Put the remaining data files on a second data diskette; these files are read only once at the beginning of a run. If VOCM cannot find a particular data file on the floppy disk in the second drive, it will pause and request that you exchange disks.

If you are using a hard disk system, you will probably want to keep the data files in the default directory of the hard disk along with the program and support files. For best performance, VOCM should be run with the program, support files, and GLOBAL.DAT file on the default directory of the hard disk and the data files on a large RAM disk. In this case, the drive letter of the RAM disk should be entered in the GLOBAL.DAT file. However, this approach is generally practical only with systems that allow large RAM disks in extended or expanded memory (e.g.,

using the extended or expanded memory option with the VDISK driver supplied with PC-DOS on a PC AT). Setting up a large RAM disk in conventional memory usually leaves too little memory for VOCM to run.

The next two sections give specific instructions for configuring your computer for two-floppy or hard disk (preferred) operation of VOCM.

CONFIGURING A TWO FLOPPY DISK DRIVE SYSTEM

This section describes the steps involved in setting up a two floppy disk drive system to run VOCM. If the VOCM user chooses not to use the file supplied with VOCM, the setup procedure permits creation of the GLOBAL.DAT file and entering the specifications of the printer and the disk drive where you will keep the data files. Alternatively, default values in the files supplied with VOCM can be modified (skip step 3 of the procedures below). VOCM needs this information before it can begin running. The procedure is as follows:

1. Insert the disk containing the program and support files (hereafter called the program disk) in Drive A. Then make Drive A the default drive by typing "A:".

2. Start the program by typing "VOCM" and press any key when the program prompts you.

3. When a GLOBAL.DAT file is not included on the disk with the program file, the program will tell you the GLOBAL.DAT file is not available and ask if it should try again to locate it. Respond by typing "N". Now the program will ask if you want it to start a new blank GLOBAL.DAT file, to try again to locate GLOBAL.DAT file, or to quit. Type "S" to have VOCM start a blank GLOBAL.DAT file. When it does it will create the file on the program disk.

4. VOCM will now display the GLOBAL.DAT file sheet. (Sheets are explained in a later chapter.) Repeatedly press the Down Arrow key until the cursor is in the "Printer Specification (or DOS file)" field. Enter the DOS identifier for your printer. Most IBM-PC's have a printer on the first parallel port and you can enter "LPT1:" or "PRN:". If you want VOCM's output to be sent to a disk file instead of your printer, enter the name of the disk file. Press the Down Arrow key to move the cursor to the "Data Disk Drive Identifier" field and enter B. Now, press the F10 key and VOCM's Main Menu will be displayed indicating that VOCM is up and running.

From now on, when this same program disk is used to start VOCM, you will not have to repeat steps 3 and 4. The GLOBAL.DAT file will be available and the model will be operational after you start the program.

If you wish to create your own data files rather than use those supplied with VOCM, an optional fifth step (listed below) is to have VOCM generate the remaining data files so that they will be available when you want to enter data into them. Alternatively, you can wait and create them as you need them.

5. Insert a newly-formatted disk into Drive B. (VOCM will create the data files on this disk, since you told it to use Drive B as the data disk drive.) Select Option 2 from the Main Menu and then select each of the seven options on the File Select Menu. When you select each option, VOCM will give you the same three choices described in Step 3 above. Enter S each time to have the data files created. After each file is created, a blank data sheet will be displayed. Press F10 twice to return to the Main Menu.

CONFIGURING A HARD DISK DRIVE SYSTEM

This section describes the steps involved in setting up a hard disk drive system to run VOCM. The setup procedure involves making a directory on the hard disk, copying the program and support files to the hard disk, creating the GLOBAL.DAT file, and entering the specifications for the printer and the disk drive where you will keep the data files. This procedure assumes that the hard disk is Drive C. The procedure is as follows:

1. If the root directory of the hard disk is the default directory, proceed to 2. Otherwise, make the Drive C the default drive by typing "C:". Make the root directory the default directory by typing "CD \".

2. Make a directory for VOCM by typing "MD VOCM" at the C prompt. Make the VOCM directory the current directory by typing "CD VOCM".

3. Insert the disks containing the VOCM program files and data files in Drive A. Copy each of the program and support data files from the disks placed in Drive A to the VOCM directory of the hard disk by typing "COPY A:*.*". Don't copy the VOCM data files if you wish to create your own.

4. Start the program by typing "VOCM". If the program immediately shows the main menu, the GLOBAL.DAT file copied from the distribution disk is being used. In this case, select Option 1 to edit the GLOBAL.DAT file rather than executing Step 5 below.

5. When a GLOBAL.DAT file is not on the hard disk, the program will tell you the GLOBAL.DAT file is not available and ask if it should try again to locate it. Respond by typing "N". Now the program will ask if you want it to start a new blank GLOBAL.DAT file, to try again to locate the GLOBAL.DAT file,

or to quit. Type "S" to have VOCM start a blank GLOBAL.DAT file. When it does it will create the file on the VOCM directory of the hard disk.

6. VOCM will now display the GLOBAL.DAT file sheet. (Sheets are explained in a later chapter.) Repeatedly press the Down Arrow key until the cursor is in the "Printer Specification (or DOS file)" field. Enter the DOS identifier for your printer. Most IBM-PC's have a printer on the first parallel port and you can enter "LPT1:" or "PRN:". If you prefer that VOCM's output be sent to a disk file instead of your printer, enter the path and name of the disk file (e.g., "OUTPUT.DAT"). Press the Down Arrow key to move the cursor to the "Data Disk Drive Identifier" field and enter C (or you may leave it blank and the default drive will be assumed). Now, press the F10 key and VOCM's Main Menu will be displayed indicating that VOCM is up and running.

When you start VOCM again, you will not need to repeat steps 5 and 6. The GLOBAL.DAT file will be available and VOCM will be operational after you type VOCM.

An optional seventh step (listed below) is to have VOCM generate the remaining data files so that they will be available when you want to enter data into them. This step can be deferred until the model projection run is started, and is not necessary if you use the data files supplied with the VOCM model.

7. Select Option 2 from the Main Menu and then select each of the seven options on the File Select Menu. When you select each option, VOCM will give you the same three choices described in Step 5 above. Enter S each time to have the data files created. Press F10 twice to return to the main menu.

PRINTER NOTES

If you enter the DOS specification for your printer (e.g., "PRN:", "LPT1:", "LPT2:") in the "Printer Specification" field of the GLOBAL.DAT file (or leave it blank in which case "PRN:" is assumed), you must have the printer hooked up and on-line when VOCM starts; otherwise you will get a message indicating that VOCM cannot access the printer. This message gives you the chance to correct the problem and continue. If you do not have a printer and wish to have VOCM print to disk, you must enter a DOS file name in this field that first time that the GLOBAL.DAT file is created.

EXITING VOCM

To exit the program, simply press the F10 key when you are at the Main Menu level. After VOCM is running a projection, the F10 key is not functional. If you want to exit the program while a projection is underway, in most cases you can accomplish this by simply typing Ctrl-C or Ctrl-Break. This will often interrupt the computation and exit from VOCM back to DOS. However, the computer may not respond to this keyboard command, and you may have to reset the computer. You do this by pressing Ctrl-Alt-Del simultaneously. Should the computer not reset, you may have to turn the computer power off, wait ten seconds, and restart the computer and the VOCM model.

Chapter 4
ENTERING INPUT DATA

Before you can run a projection, you must provide VOCM with the data it needs to make a projection. You can do this in two ways - by typing the data into the data files using VOCM's data entry system (called the "Sheet Editor") or by importing the data from a file that already exists. As was described in Chapter 3, a complete set of data files are supplied with the model. Either these files or user created data files can be used to run VOCM. This chapter describes the data that VOCM uses and explains the ways to input these data.

DESCRIPTION OF INPUT DATA FILES

VOCM uses the following kinds of data in making a projection:

Constraints — These data consist of information about each constraint that will limit emissions in the projection year. The data include such items as the industrial category(s) and region(s) that the constraint affects; the year that the constraint becomes effective (the beginning year) and the year sources are expected to be in complete compliance with it (the target year); whether the constraint affects existing or new/replaced processes; whether the constraint affects attainment and/or non-attainment areas; and the penetration and required level of control.

Emissions — These data consist of the levels of uncontrolled and controlled emissions in the base year for each industrial category in each region. The uncontrolled and controlled

	emissions are divided between attainment and non-attainment areas.
Growth Rates	These are the annual growth rates for each sector (i.e., for each industrial category in each region). Growth rates can be provided for up to seven different time periods in the projection horizon for each sector.
Retirement Rates	These are the annual retirement rates for each industrial category.
Costs	These data consist of cost effectiveness values for controlling emissions and the industrial categories to which the costs are applicable.
Rollbacks/Offsets	These data consist of regional rollback levels and years for rollback analyses, and regional offset levels and years for constraints that require additional offset emissions (typically non-attainment areas).
Aggregation	These data are the industrial categories for which the projection results are to be aggregated.
Global Data	These data consist of miscellaneous information that is pertinent to the overall projection. The data include default values, hardware identifiers, and output specifications.

Data entries for some of the data types described above are optional. For example, if you don't have specific growth rate

values for one or more sectors, you can enter one general growth rate in the GLOBAL.DAT file. Likewise, if you don't have specific retirement rate values for one or more industrial categories, you can enter one general retirement rate in the GLOBAL.DAT file. These general rates will then be used every time VOCM can't find a specific growth rate for a particular sector or a specific retirement rate for a particular industrial category. However, although general rates may be specified for a VOCM projection run, the GROWTH.DAT and RETIRE.DAT files must be available on the disk even though they may not contain any data.

Aggregation and cost data are needed only if you wish the model to perform aggregation and/or costing. You may specify that you wish these analyses to be performed by making an appropriate entry in the GLOBAL.DAT file. If you don't perform these analyses, you do not need to have the AGG.DAT and COST.DAT files on disk.

Rollback and offset data are optional. You need enter rollback years and levels for a region only if you wish to limit emissions for the region in the projection year to some fraction of prior year emissions. You need enter offset years and levels only if you are specifying offset constraints in the constraint file. However, you must provide the ROLLOFF.DAT file even if it contains no actual data.

VOCM'S DATA-ENTRY SYSTEM: THE SHEET EDITOR

One way to provide VOCM with the data it needs is to type it directly into the data files using VOCM's data-entry system (called the "Sheet Editor"). The Sheet Editor provides for easy entry and manipulation of the input data. It is based on the concept of each data file being organized as a stack of sheets. Each sheet contains blanks in which you enter information from the keyboard. The Sheet Editor allows you to:

* enter information into the sheets,
* change information in the sheets,
* add and delete sheets,
* move through the sheets,
* sort sheets, and
* print sheets.

To access the Sheet Editor, you first select "Create/Edit Input Data Files (Sheet Editor)" from the Main Menu. This brings up the File Select Menu shown in Figure 4-1. You then select the type of data that you want to enter and/or edit. This invokes the Sheet Editor and causes the first sheet in the data file to be displayed.

Global data and the GLOBAL.DAT file are not included on the File Select Menu because every feature of the Sheet Editor is not functional for the GLOBAL.DAT file. However, the special keys described in the "Entering Information into a Sheet" section below can be used to enter and edit data in the GLOBAL.DAT file.

Entering Information into a Sheet

You enter information into a sheet by typing the information into the blanks on the sheet. These blanks are referred to as "fields". A field can be one character long or many characters long. There are a number of special keys that are used to edit fields and move around on the sheets. These keys are described below:

Down Arrow	The Down Arrow key moves the cursor from one field to the next. When a field is more than one line long, it moves the cursor to the next line in the field. The direction of movement is from left to right and from top to bottom. When the cursor is in the last field on the sheet, Down Arrow causes the cursor to "wrap around" the sheet to the first field of the sheet.

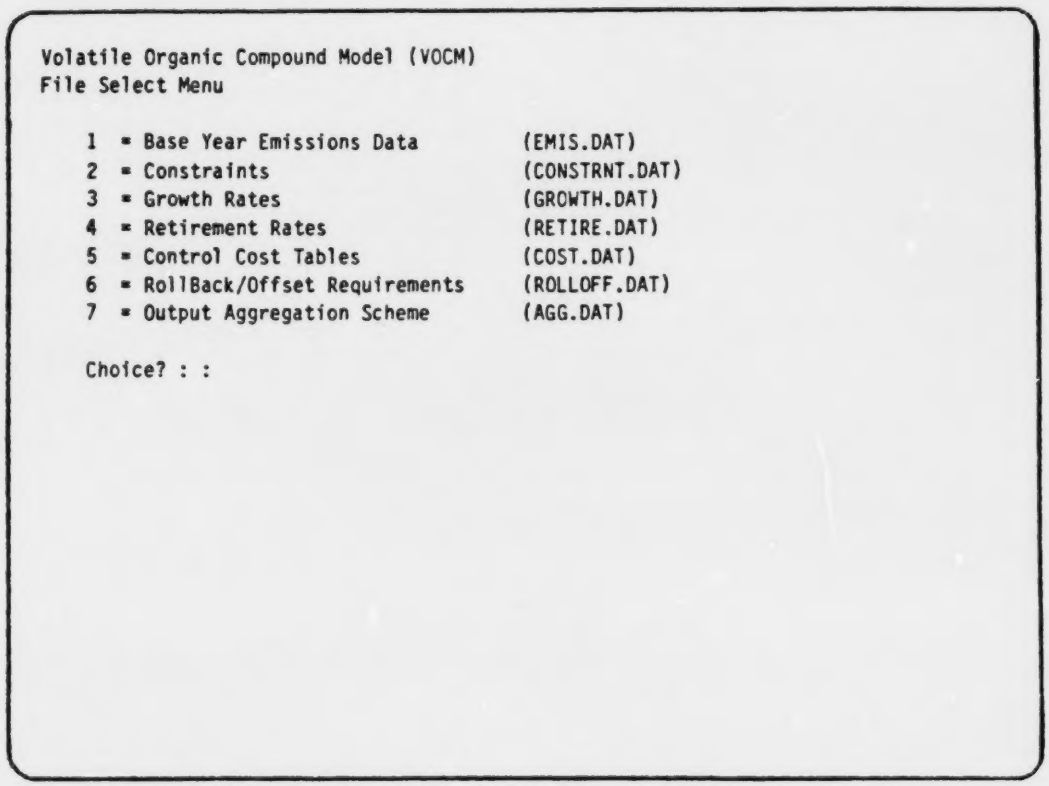

Volatile Organic Compound Model (VOCM)
File Select Menu
1 = Base Year Emissions Data (EMIS.DAT)
2 = Constraints (CONSTRNT.DAT)
3 = Growth Rates (GROWTH.DAT)
4 = Retirement Rates (RETIRE.DAT)
5 = Control Cost Tables (COST.DAT)
6 = RollBack/Offset Requirements (ROLLOFF.DAT)
7 = Output Aggregation Scheme (AGG.DAT)
Choice? : :

Figure 4-1. File Select Menu

Up Arrow	The Up Arrow key behaves the same as the Down Arrow key except that the cursor moves in the opposite direction (i.e., from right to left and from bottom to top). When the cursor is in the first field of the sheet, the Up Arrow key causes the cursor to wrap around to the last field of the sheet. This provides a quick way to get to the last field of the sheet, without having to use the Down Arrow key to move through all the fields of the sheet.
Left/Right Arrows	These keys move the cursor left and right within a field or within a single line of a multi-line field without erasing existing characters. The cursor will not wrap around when the end or beginning of the field is reached.
Ins	The Ins key toggles the Screen Editor into an insert mode. In this mode, any characters you type will be inserted into the field rather than written over the characters that are already in the field. The characters you type are inserted at the location of the cursor; all characters to the right of the cursor are moved to the right. To toggle out of the insert mode, press the Ins key a second time.
Del	The Del key deletes the character located at the cursor. Characters can also be deleted and replaced by typing over them.

Backspace	The Backspace key deletes the characters located to the left of the cursor.
Esc	The Esc key erases the contents of the field that the cursor is in.
Ctrl-Home	The Ctrl-Home key combination erases the contents of all the fields on a sheet.
Enter	The Enter key records all the information contained on a sheet in the data file. Until you press the Enter key (or one of the function keys described below), you can cancel all the information that you entered and return to the way the sheet was previously by pressing Shift-F10. Although the Enter key may be used after typing an item into a field, this practice is not recommended since it will preclude cancelling anything you entered on the form using the F10 key (see below). For this reason, the recommended practice is to use the Down Arrow key to move to another field after entering data.
Shift-F10	The Shift-F10 key combination cancels all the changes you have made on the sheet since you began editing it. It is useful when you make a mistake while editing and want to start over again.
F10	The F10 key exits the Sheet Editor and returns you to the File Select Menu or Main Menu if editing the GLOBAL.DAT file.

Moving Through the Sheets

Several of the function keys (the ten keys on the left side of the keyboard) allow you to move through all the sheets in a particular data file. You can move forward or backward through the sheets, one sheet at a time or in multiples of five or ten. You can also go to a specific sheet by specifying the sheet number. The keys that are used to move through the sheets are described below:

F1 -1 sheet - The F1 key moves backward one sheet.

F2 +1 sheet - The F2 key moves forward one sheet.

F3 -5 sheets - The F3 key moves backward five sheets.

F4 +5 sheets - The F4 key moves forward five sheets.

Pressing the Shift key before pressing any of these keys amplifies the effect of the key by ten times. For example, Shift-F1 moves backward ten sheets and Shift-F4 moves forward fifty sheets.

F5 Go To - The F5 key allows you to go to any particular sheet you desire. You will be asked for the number of the sheet to which you want to go.

Displaying an Index to the Sheets

To allow you to locate a particular sheet easily, the Sheet Editor can display an index of the data file. The index contains the sheet number and the first 60 characters of each sheet in the file. You can display the index by pressing the Shift-F5 key combination. When you do, as many of the sheets as will fit on the screen are listed, beginning with the sheet you are currently editing. Use the Up and Down Arrow keys to scroll through all the sheets.

Sorting Sheets

The Sheet Editor allows you to order the sheets alphabetically in a file according to the contents of the first field of the sheet. Having sheets in alphabetic order facilitates finding a particular sheet. You invoke a sort by pressing the Shift-F6 key combination. Because the sort routine used by Version 1.8 of VOCM is relatively inefficient, sorting large files can be quite time-consuming (up to several hours for a file with several hundred sheets - especially with a floppy disk system). For this reason, when you ask for a sort, VOCM will ask you to confirm that you want a sort performed.

Adding, Deleting, and Moving Sheets

A useful feature of the Sheet Editor is its "Cut and Paste" ability. You use this feature to add a sheet to a file, delete a sheet from a file, or move a sheet from one place in a file to another. The function keys that implement this feature are described below. Key to understanding their operation is the concept of the "clipboard." The clipboard is a temporary holding place for a sheet.

F6 — Cut to Clipboard - The F6 key cuts the currently displayed sheet out of the data file and puts it in the clipboard. The currently displayed sheet is removed from the file.

F7 — Copy to Clipboard - The F7 key copies the currently displayed sheet to the clipboard. It works just like the F6 key except that the currently displayed sheet remains in the data file.

F8 — Paste After Current Sheet - The F8 key pastes the sheet that is in the clipboard after the currently displayed sheet.

Shift-F8 Paste Before Current Sheet - The Shift-F8 key combination pastes the sheet that is in the clipboard before the currently displayed sheet.

The clipboard always contains a blank sheet until you copy or cut another sheet to it. Thus, when you need to add a new sheet to a data file, you can simply press the F8 key and a blank sheet will be added behind the current sheet. If you will be entering a lot of similar data in which many sheets will contain identical data in all but a few fields, you will find the F7 key useful. Use it to copy the current sheet. The copied sheet can then be used as a template for another sheet - simply change the few fields that are different. This way you don't have to reenter the same information over and over.

Printing Sheets

The following two keys are used to print sheets:

F9 Print Current Sheet - The F9 key prints the currently displayed sheet. Your printer needs to be connected and on-line.

Shift-F9 Print All Sheets - The Shift-F9 key combination prints all the sheets in the data file you are editing. Because this operation can be quite time consuming for large files, you will be asked to confirm this operation. Your printer needs to be connected and on-line.

ID's and Wild Cards

One type of data that needs to be entered into almost every data file sheet is an ID (or many IDs). An ID is a code or name that you specify to uniquely identify a region or industrial category. (A region ID can be the same as an industrial category ID, but no two region ID's can be alike and no two industrial

category ID's can be alike.) An ID can be up to ten characters long.

Often you will need to specify the ID's of several regions or industrial categories that are affected by an item of data (e.g., you might want to indicate that a particular constraint is applicable to multiple regions or multiple industrial categories). To save you time and space when you need to enter more than one ID, VOCM has provided a "wild card" feature.

A wild card is a question mark ("?") that is substituted for a character in an ID. VOCM interprets the wild card as any character. For example, you could indicate the two ID's "NJATT" and "NJNATT" (representing New Jersey Attainment and New Jersey Non-attainment, respectively), by simply entering "NJ????". VOCM will interpret each "?" to be any character (including blanks). Note that you have to use a wild card for each character in the longest ID that you want to be considered. For example, in this case you could not enter "NJ???". If you did, only the "NJATT" ID would be considered. The "NJNATT" ID would not be considered to match since it has four characters after the "NJ," not just three. Some examples of right and wrong uses of wild cards are listed below:

Multiple ID's	Incorrect Use of Wild Cards	Correct Use of Wild Cards
55555A and 55555B	5?	55555?
SIC123 through SIC1255	SIC12?	SIC12??
All ID's	?	??????????

An alternative way to indicate all ID's is simply to enter "ALL" (in upper or lower case letters). Because the word "ALL" has a special meaning to VOCM, never use this word as an identifier.

Please note that VOCM interprets identifiers as characters rather then numbers. Thus, the identifiers "01" and "1" are different to VOCM and do not match. If you note a problem where VOCM appears to be failing to apply a constraint, growth rate, or

cost table to a region or industrial category, check to be sure that an error has not been made of this type.

IMPORTING DATA FILES

VOCM's sheet editor, described in the previous section, offers a simple way to enter data from the keyboard. However, is requires that all data used by VOCM be typed directly into VOCM. This can be very time consuming for large files.

VOCM can also read emissions and growth data from standard ASCII (American Standard Code for Information Interchange) files. The emissions and growth files provided with VOCM were developed by mainframe computers and downloaded as ASCII text files that could be imported into VOCM. As of Version 1.8, the ability to import data files is provided for emissions and growth files only; later versions of VOCM may provide this capability for other data files.

If you are proficient with a text editor you may find that you can enter data faster by creating an ASCII file and then importing the file to VOCM. It may also be easier to reorganize data files using the block cut and paste features available in many text editors. However, keep in mind that while VOCM can import ASCII text files into its data file format, it currently cannot do the reverse (export its data file format to ASCII files). Therefore, if you decide to use a text editor to make changes on an ongoing basis to your data files, you should not use the sheet editor to make any changes. If you use the sheet editor, you will not be able to produce a text file version reflecting the changes made in the sheet editor. Instead, make all changes using your text editor and re-import the file into VOCM after each change.

In the ASCII file, you must enter the same items of information that you would enter into the data file sheet for the particular data type. And this information must be organized to resemble the layout of the information on the sheet. In effect, you create "sheet images." Figure 4-2 illustrates this idea. It

Volatile Organic Compound Model (VOCM)
Emission Data

Region ID:Kansas :
Comment :Emissions data for state of Kansas :

Ind Cat ID	Unc-A	Ctr-A	Unc-NA	Ctr-NA
:303112 :	:12564 :	:345 :	:0 :	:0 :
:303113 :	:678 :	:211 :	:0 :	:0 :
:303117 :	:2390 :	:21 :	:0 :	:0 :
:304009 :	:32879 :	:15345 :	:0 :	:0 :
: :	: :	: :	: :	: :
: :	: :	: :	: :	: :
: :	: :	: :	: :	: :
: :	: :	: :	: :	: :
: :	: :	: :	: :	: :
: :	: :	: :	: :	: :

Notes: 1. All data in tons/year.
2. Wild cards may not be used.
3. A region may have multiple sheets in any order.

```
Kansas
Emissions data for state of Kansas
303112 12564 345 0 0
303113 678 211 0 0
303117 2390 21 0 0
304009 32879 15345 0 0
```

Figure 4-2. Sheet and Corresponding ASCII Text File.

shows a EMISSIONS.DAT file sheet on the top that would be created by importing the sheet image ASCII file shown on the bottom. Notice that there is a one-to-one correspondence between the lines of data in the data file sheet and the lines in the sheet image. Each line of the data file sheet that contains a field for entering data must have a corresponding line in the sheet image, except as noted below.

For lines with multiple data items (e.g., each line of the emissions data sheet containing the industrial category ID and various emission numbers), the data items may be entered into a line in the sheet image in a "free-format" manner without worrying about the particular spacing of the data items. However, the individual data items should be separated from each other by a space or comma.

A blank line is included at the end of the sheet image to separate it from the next sheet in the file. However, you do not need to provide a blank line if you have more industrial categories than can fit on a sheet. For example, if you are creating an emission data ASCII text file and a region has 50 industrial categories, you can follow the region ID and comment lines with 50 lines of data without repeated inserting a blank line, region ID line, and comment line after every 10 industrial categories. VOCM will automatically create new sheets and repeat the Region ID and Comments on each additional sheet in this situation.

Once you have entered data into ASCII text files, you can have VOCM transfer the data to the appropriate VOCM data files by selecting "Import Input Data" from VOCM's Main Menu. When you select this option, VOCM displays the File Select Menu. From this menu choose the type of data that you want to import. Then VOCM will prompt you for the name of the file containing the data you want to import. After you enter the filename, VOCM transfers the contents of the file you named to the VOCM data file currently in use. For example, if you choose "Base Year Emissions Data" on the File Select Menu and enter "EMIS.TXT" as the name of the

ASCII text file, the data in the EMIS.TXT file will be imported into the EMIS.DAT file.

The VOCM data file to which data is imported does not need to be empty; if it already contains data, the data that is imported is added to the end of the file. Thus, you can import data from several different files into the same VOCM data file.

Chapter 5
RUNNING A PROJECTION

Once you have installed VOCM on your PC with the necessary input data files described in Chapter 4, you can run a projection. This chapter explains how to run a projection using the data files supplied with the model, and gives an example of how the user can input alternative data files into VOCM and run a projection.

GENERAL PROCEDURE

The procedure for running a projection generally involves four steps:

1. Starting the model.

2. Entering general projection specifications into the GLOBAL.DAT file sheet. This includes data on defaults, computer system configuration, analysis options, and what output you desire from the projection.

3. Entering data into the various input data files (e.g., emissions, cost, constraint data files) to be used. This step is not necessary if you wish to use the data files provided with VOCM.

4. Running the projection.

These steps are explained in the following sections.

Starting the Model

Type "VOCM" from the DOS prompt and press any key after the program displays its initial message. This will then bring up the Main Menu as depicted in Figure 5-1. If VOCM attempts to access the global data file and is unable, you will get a message

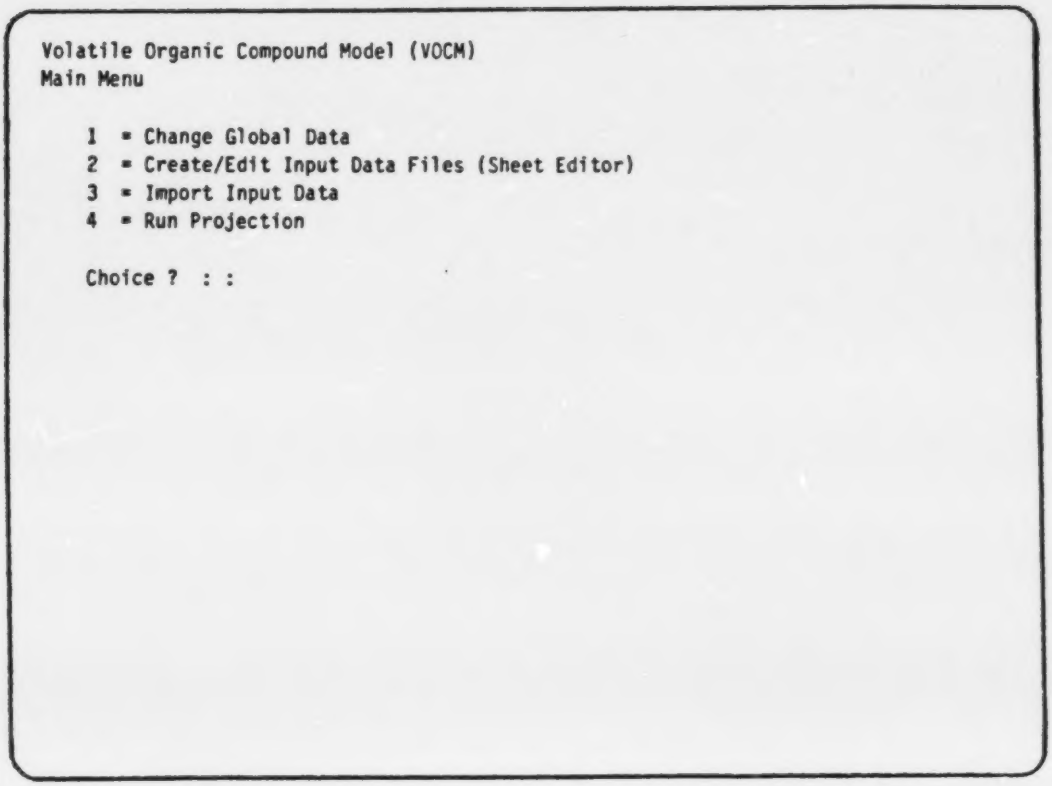

Volatile Organic Compound Model (VOCM)
Main Menu
1 = Change Global Data
2 = Create/Edit Input Data Files (Sheet Editor)
3 = Import Input Data
4 = Run Projection
Choice ? : :

Figure 5-1. Main Menu.

saying the global data file is unavailable. You should review the Chapter 3 ("Getting Started") to be sure you have a global file created and available to VOCM.

Entering General Projection Specifications

Select "Change Global Data" on the Main Menu to change the global data file. The global data file sheet will appear (Figure 5-2) and you can enter appropriate values for your projection using the sheet editor commands as described in Chapter 4. Although the global file can have multiple sheets like the other data files, only the first sheet is significant to VOCM. Appendix A ("VOCM's Data File Sheets") provides details of each field on this sheet. When you are finished entering data, press F10 to return back to the main menu.

Entering Data into Input Data Files

To change data in VOCM's input data files, select "Create/Edit Input Data Files" from the main menu. The File Selection Menu (Figure 5-3) will appear allowing you to select the input data file you wish to change. Select the file you wish to change. The first sheet in the file will then appear and the sheet editor commands described in Chapter 4 can be used to edit the data on the sheet, move around between sheets, and add or delete sheets. Appendix A ("VOCM's Data File Sheets") provides details of each field on each sheet for all seven VOCM input data files (eight including the GLOBAL.DAT file). Press F10 to return to the File Select Menu; pressing F10 again will return you to the Main Menu.

If you wish to use the data files provided with VOCM, you do not need to change any data files. However, you may wish to briefly access each one with the sheet editor to confirm that the data files are available to VOCM.

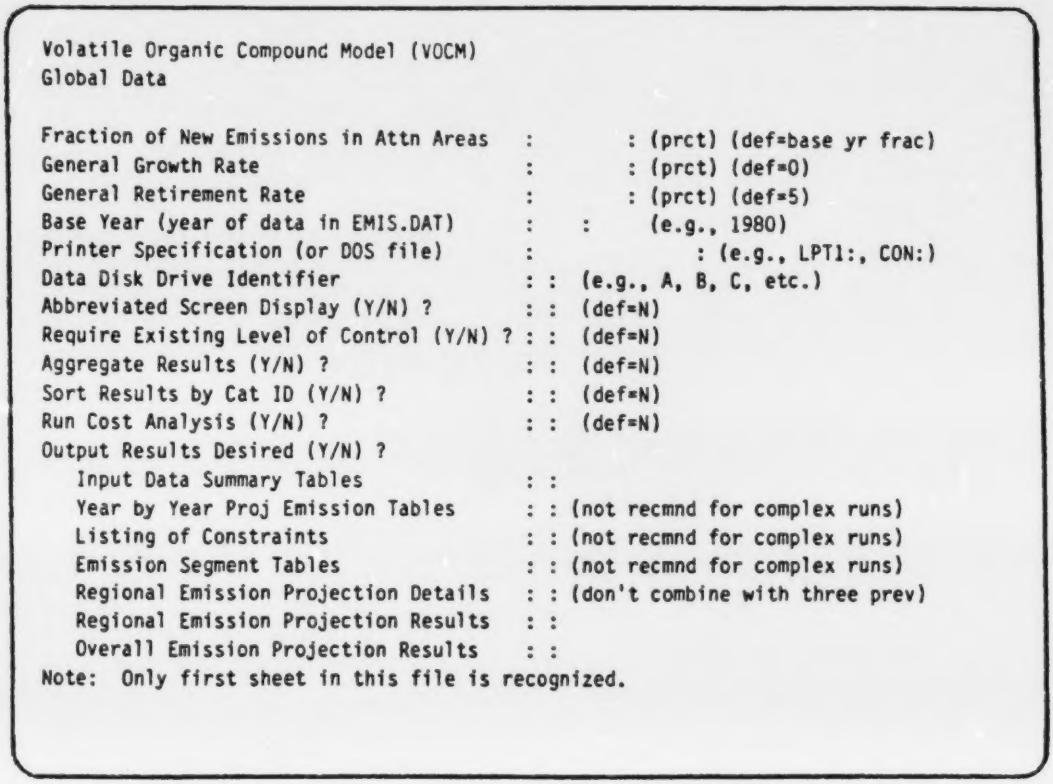

Volatile Organic Compound Model (VOCM)
Global Data
Fraction of New Emissions in Attn Areas : : (prct) (def=base yr frac)
General Growth Rate : : (prct) (def=0)
General Retirement Rate : : (prct) (def=5)
Base Year (year of data in EMIS.DAT) : : (e.g., 1980)
Printer Specification (or DOS file) : : (e.g., LPT1:, CON:)
Data Disk Drive Identifier : : (e.g., A, B, C, etc.)
Abbreviated Screen Display (Y/N) ? : : (def=N)
Require Existing Level of Control (Y/N) ? : : (def=N)
Aggregate Results (Y/N) ? : : (def=N)
Sort Results by Cat ID (Y/N) ? : : (def=N)
Run Cost Analysis (Y/N) ? : : (def=N)
Output Results Desired (Y/N) ?
Input Data Summary Tables : :
Year by Year Proj Emission Tables : : (not recmnd for complex runs)
Listing of Constraints : : (not recmnd for complex runs)
Emission Segment Tables : : (not recmnd for complex runs)
Regional Emission Projection Details : : (don't combine with three prev)
Regional Emission Projection Results : :
Overall Emission Projection Results : :
Note: Only first sheet in this file is recognized.

Figure 5-2. Global File Sheet.

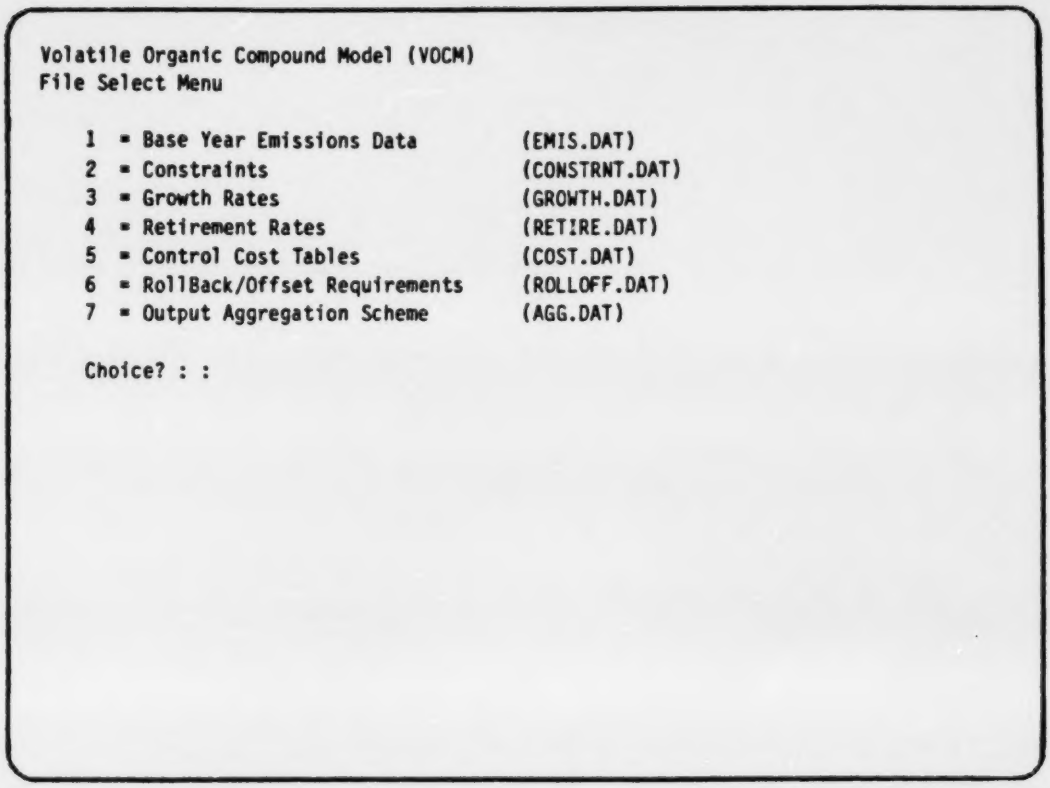

Volatile Organic Compound Model (VOCM)
File Select Menu
1 = Base Year Emissions Data (EMIS.DAT)
2 = Constraints (CONSTRNT.DAT)
3 = Growth Rates (GROWTH.DAT)
4 = Retirement Rates (RETIRE.DAT)
5 = Control Cost Tables (COST.DAT)
6 = RollBack/Offset Requirements (ROLLOFF.DAT)
7 = Output Aggregation Scheme (AGG.DAT)
Choice? : :

Figure 5-3. File Select Menu.

If you wish to use the data files provided with VOCM, you do not need to change any data files. However, you may wish to briefly access each one with the sheet editor to confirm that the data files are available to VOCM.

Running the Projection

With all data files available to VOCM, a projection can be initiated. The next step is to select "Run Projection" from the main menu. VOCM then prompts you for the following three items of information:

1. the projection year(s),

2. the ID(s) of the region(s) you want included in the projection, and

3. the ID(s) of the industrial category(s) you want included in the projection.

At any of these three prompts, you may cancel a projection and return to the Main Menu by pressing the Enter key without entering any data. Once you have responded to these three prompts and the projection has begun, you can cancel a projection by typing Ctrl-C or Ctrl-Break; however, this returns you to DOS.

In response to the prompt for the projection year(s), type the year or years for which you wish a projection and press the Enter key. Separate multiple years with commas or spaces. You can enter any year from one year beyond the base year to seventy (70) years beyond the base year. For example, if you specified (on the GLOBAL.DAT file sheet) 1980 as the base year, you could enter any year from 1981 through 2050. Respond to the prompts for the region ID(s) and industrial category ID(s) by typing the IDs of all the regions and industrial categories specified in the EMIS.DAT file that you want included in the projection. Separate the IDs with commas or spaces. You can use wild cards to

indicate multiple IDs or enter "ALL" (or "all") to indicate that you want all the regions or industrial categories specified in the EMIS.DAT file included in the projection.

After you respond to the prompt for the industrial category ID(s), VOCM begins reading all the data files. It displays messages on the screen to let you know which file it is reading and how many items (e.g., constraints, retirement rates, etc.) were read. By watching these messages you can catch problems that might exist. For example, suppose you forgot to enter some constraints. By observing the messages, you would note that not as many constraints as you intended were read. You could then stop the projection (by pressing Ctrl-C or Ctrl-Break), restart VOCM, enter the constraint data you forgot to enter, and rerun the projection.

Because it is usually more efficient to do so, VOCM reads the entire contents of each data file even though you may have requested that only some of the regions and industrial categories be included in the projection. After VOCM performs an initial reading of all the data files, it begins the projection for the first projection year that you specified. It projects emissions region by region and displays messages on the screen indicating which region is currently being processed. Within each region, VOCM projects emissions industry by industry and displays messages indicating which industry is currently being processed. You can turn these messages off by setting the "Abbreviated Screen Display" option in the GLOBAL.DAT file; doing so improves the running time of the model somewhat.

If VOCM cannot find a particular data file on the data disk drive specified in the GLOBAL.DAT file sheet, it will pause and allow you to insert a disk containing the required file. This allows you to run VOCM on a floppy-disk system with data files on several disks by swapping disks in and out on the same disk drive. However, to maintain disk-swapping at manageable levels, be sure to keep the GROWTH.DAT and EMIS.DAT files on the same disk. After initially reading all the data files, VOCM accesses

these two files continually throughout the projection. If you keep these two files on the same disk, no disk-swapping will be required after the initial reading has been completed.

Depending on what print options you have specified, VOCM may print during the projection or may delay printing until an entire projection is completed. If you requested projections for more than one year, VOCM prints the output for one year before it begins the projection for the next year. If you have indicated that you want the output to be sent to a disk file (by entering a DOS filename in the "Printer Specification" field of the GLOBAL.DAT file sheet - highly recommended for improved running time), the output will not be printed on your printer.

These are all the steps necessary to operate VOCM with the data files supplied with the model or with user specified data files. The next two sections shows how user specified data can be entered into VOCM and illustrates sample data for an example run.

VOCM RUN WITH USER SPECIFIED DATA FILES

User specified data can be input to the VOCM data files from a text file by using the "Import Input Data" option at the main menu (emissions and growth files only) or by direct entry from the keyboard. This section gives an example in which data files are created from the keyboard and are used to run a projection.

Example Description

The example used in this section projects 1990 VOC emissions from Industry A in Region 1. The following information about Industry A is available:

1. The annual growth rate of Industry A in Region 1 is expected to be 10% through 1982; 15% between 1982 and 1985; and 20% between 1985 and 1995.

2. The annual retirement rate of Industry A is 5%.

3. Total uncontrolled emissions in 1980 are 1000 tons/year (TPY): 400 TPY are in attainment areas and 600 TPY are in non-attainment areas. This same partitioning of emissions is expected in new emissions as well.

4. The level of control in 1980 is 50%.

5. New/replaced processes are subject to an NSPS that became effective in 1982. It requires a 90% absolute level of control and is applicable to all of the new and replaced processes (i.e., penetration is 100%).

6. New/replaced and existing processes are subject to a SIP that became effective in 1984. It requires 80% absolute control, is applicable only to non-attainment areas and penetrates only 50% of the processes.

7. Costs of controlling VOC emissions from Industry A are as follows:
   30% control efficiency - $150/ton
   60% control efficiency - $300/ton
   90% control efficiency - $800/ton

Setting up the Data

Figure 5-4 depicts the global data sheet for this example analysis. The "Fraction of New Emissions in Attn Areas" field has been left blank since new growth is expected to be partitioned in the same proportions as the existing base year emissions. The base year has been entered as 1980. The remaining fields have to do with the particular configuration of computer system the example is being run on, and various analysis and output options. Appendix A ("VOCM's Data File Sheets") provides a detailed explanation of each field.

Figures 5-5 through 5-9 depict data sheets for the base year emissions, constraints, growth rates, retirement rates, and control cost sheets. Since no aggregation is desired, an aggregation data file does not need to be provided. This analysis involves no rollbacks or offset constraints; the rollback/offset file must be provided but can be left blank. Appendix A ("VOCM's Data File Sheets") provides a detailed explanation of each field in each data file.

Running the Projection

From the Main Menu, "Run Projection" is selected to begin the projection. In response the prompt for the projection year, type:

1990 [ENTER]

In response to the prompt for the region(s) you want included in the projection, type:

1 [ENTER]

In response to the prompt for the industrial category(s) you want included in the projection, type:

A [ENTER]

Because Region 1 and Industry A are the only regions and industrial categories included in the EMIS.DAT file, you could have typed "ALL" in response to the region and industrial category prompts and achieved the same results.

VOCM will now begin the projection. When it finishes, the output you requested will be printed. The output for this example projection is shown in Appendix B ("VOCM's Output").

```
Global Data                                File:GLOBAL.DAT      Sheet 1    of 1

Fraction of New Emissions in Attn Areas   :        : (prct) (def=base yr frac)
General Growth Rate                       :        : (prct) (def=0)
General Retirement Rate                   :        : (prct) (def=5)
Base Year (year of data in EMIS.DAT)      :1980:     (e.g., 1980)
Printer Specification (or DOS file)       :lpt1:         : (e.g., LPT1:, CON:)
Data Disk Drive Identifier                :d:  (e.g., A, B, C, etc.)
Abbreviated Screen Display (Y/N) ?        :n:  (def=N)
Require Existing Level of Control (Y/N) ? :y:  (def=N)
Aggregate Results (Y/N) ?                 :n:  (def=N)
Sort Results by Cat ID (Y/N) ?            :n:  (def=N)
Run Cost Analysis (Y/N) ?                 :y:  (def=N)
Output Results Desired (Y/N) ?
   Input Data Summary Tables              :y:
   Year by Year Proj Emission Tables      :n: (not recmnd for complex runs)
   Listing of Constraints                 :n: (not recmnd for complex runs)
   Emission Segment Tables                :n: (not recmnd for complex runs)
   Regional Emission Projection Details   :y: (don't combine with three prev)
   Regional Emission Projection Results   :y:
   Overall Emission Projection Results    :y:
```

Figure 5-4. Example Global Sheet.

```
Emission Data                          File:EMIS.DAT        Sheet 1    of 1

Region ID:1         :
Comment  :Emission data for Industry A in Region 1                          :

 Ind Cat ID          Unc-A           Ctr-A           Unc-NA          Ctr-NA
:A          :       :400     :      :200     :      :600     :      :300     :
:           :       :        :      :        :      :        :      :        :
:           :       :        :      :        :      :        :      :        :
:           :       :        :      :        :      :        :      :        :
:           :       :        :      :        :      :        :      :        :
:           :       :        :      :        :      :        :      :        :
:           :       :        :      :        :      :        :      :        :
:           :       :        :      :        :      :        :      :        :
:           :       :        :      :        :      :        :      :        :
:           :       :        :      :        :      :        :      :        :

Notes:  1.  All data in tons/year.
        2.  Wild cards may not be used.
        3.  A region may have multiple sheets in any order.
```

Figure 5-5. Example Emissions Sheet.

```
 Constraint Data                          File:CONSTRNT.DAT    Sheet 1    of 2

Name        :NSPS affecting new/replaced sources for Industry A in Region 1   :
Region IDs  :1                                                                :
            :                                                                 :
Ind Cat IDs :A                                                                :
            :                                                                 :
            :                                                                 :
            :                                                                 :
            (Separate ID's with commas or spaces, wild cards may be used)

Beg Yr      :1982: (Calendar)    Target Year :1982: (Calendar)

New Prcs?   :y: (Y or N, def=N)  Exist Prcs? :n: (Y or N)
Attain?     :y: (Y or N, def=N)  Non-Attn?   :y: (Y or N)
Offset?     :n: (Y or N, def=N)

Abs Ctrl    :90      :  (Percent level of control over unc)
Penetration :100     :  (Percent of all sources affected)
```

Figure 5-6. Example Constraint Sheets.

```
 Constraint Data                          File:CONSTRNT.DAT    Sheet 2    of 2

Name         :SIP affecting all emissions for Industry A in Region 1          :
Region IDs   :1                                                               :
             :                                                               :
Ind Cat IDs  :A                                                              :
             :                                                               :
             :                                                               :
             :                                                               :
             (Separate ID's with commas or spaces, wild cards may be used)

Beg Yr       :1984: (Calendar)    Target Year :1984: (Calendar)

New Prcs?    :y: (Y or N, def=N)  Exist Prcs? :y: (Y or N)
Attain?      :n: (Y or N, def=N)  Non-Attn?   :y: (Y or N)
Offset?      :n: (Y or N, def=N)

Abs Ctrl     :80      :  (Percent level of control over unc)
Penetration  :50      :  (Percent of all sources affected)
```

Figure 5-6. Example Constraint Sheets (continued).

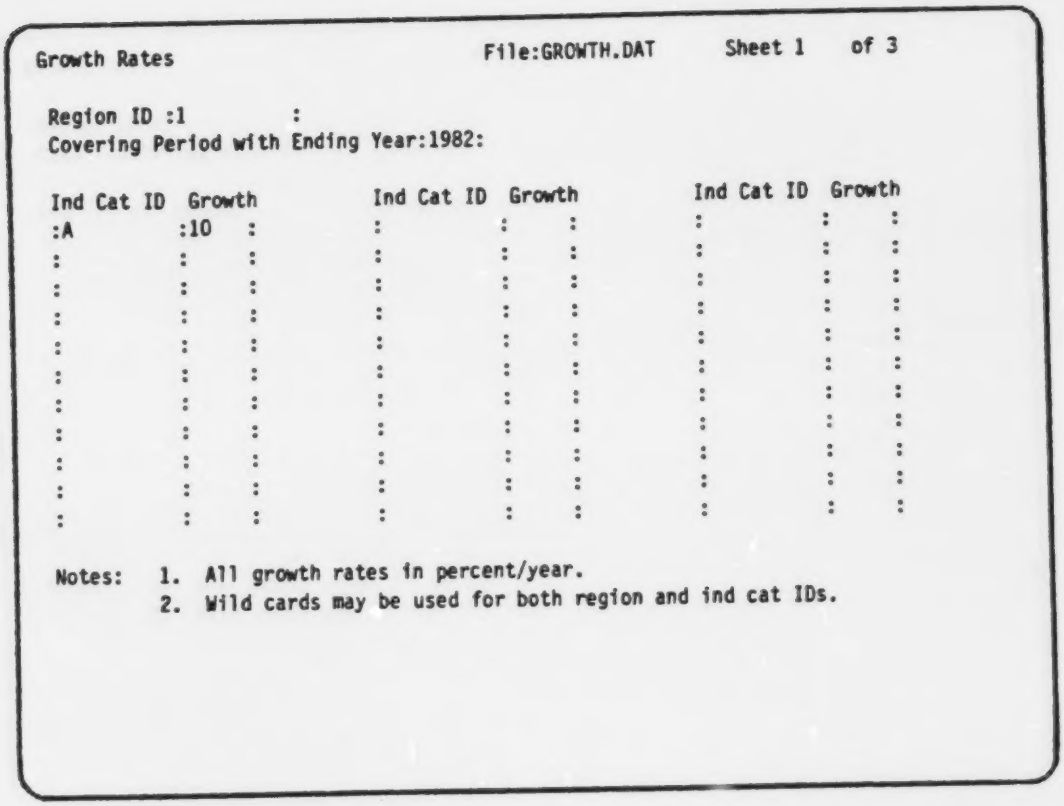
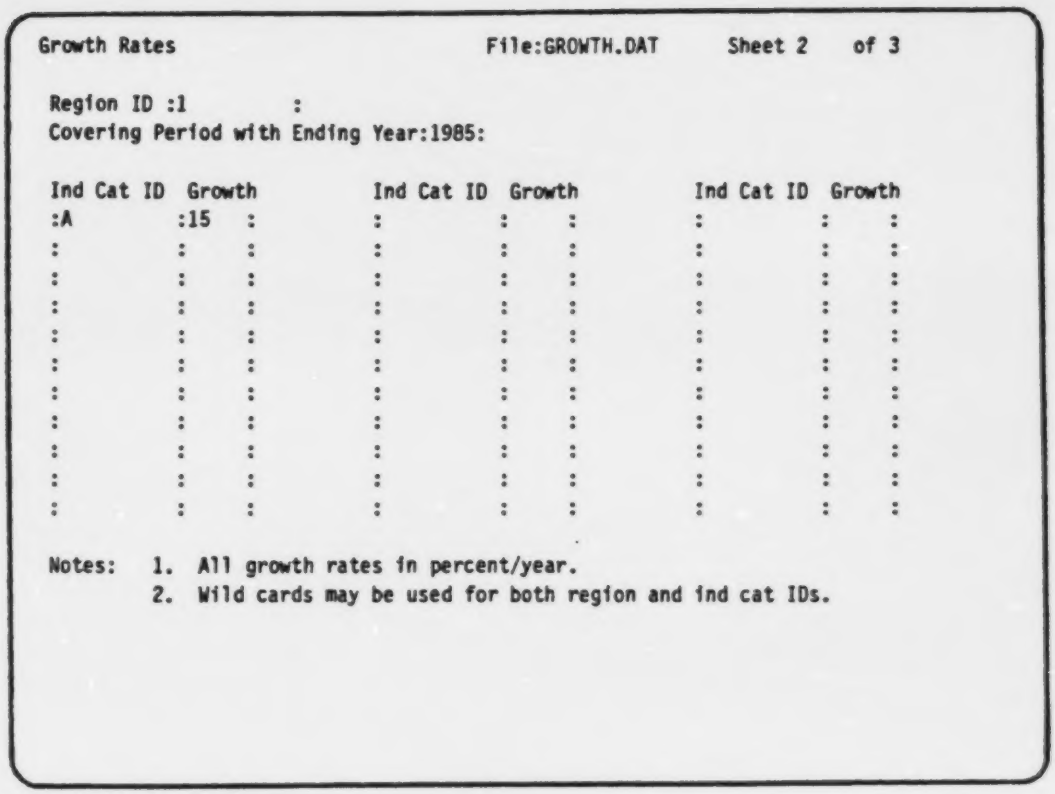

Growth Rates
File:GROWTH.DAT
Sheet 1 of 3
Region ID :1 :
Covering Period with Ending Year:1982:
Ind Cat ID Growth
Ind Cat ID Growth
Ind Cat ID Growth
:A :10 :
Notes: 1. All growth rates in percent/year.
2. Wild cards may be used for both region and ind cat IDs.

Figure 5-7. Example Growth Rate Sheets.



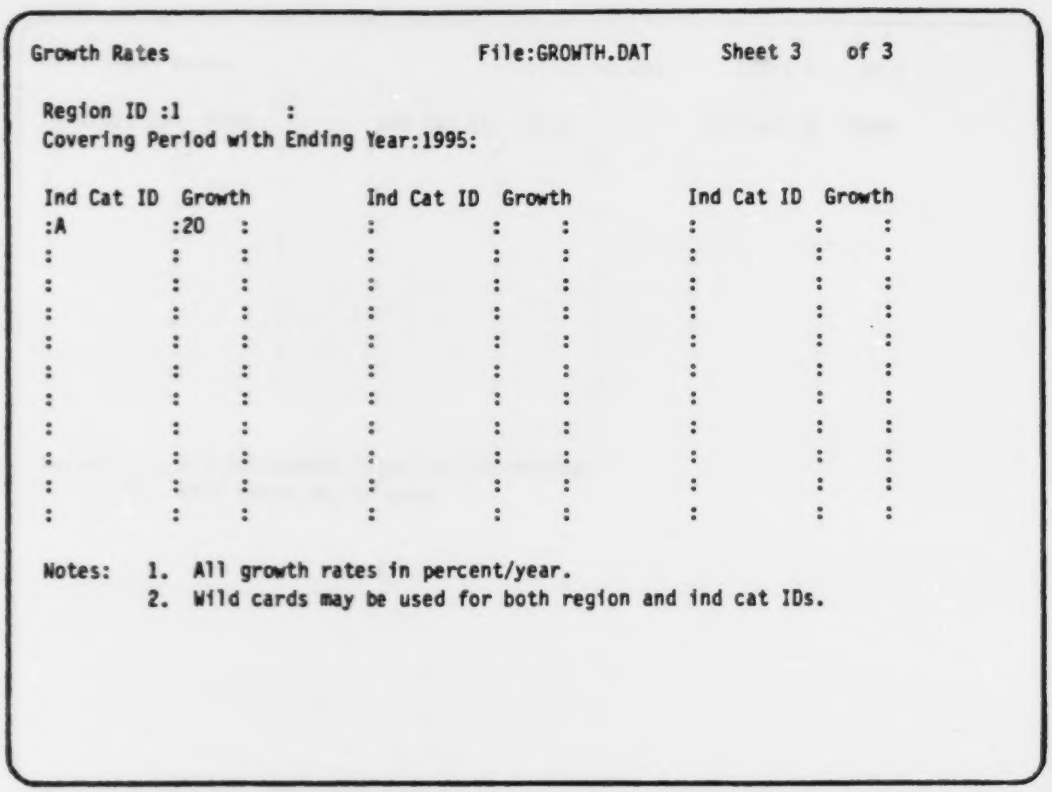
Growth Rates File:GROWTH.DAT Sheet 2 of 3

Region ID :1 :
Covering Period with Ending Year:1985:

Ind Cat ID	Growth	Ind Cat ID	Growth	Ind Cat ID	Growth
:A	:15 :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :

Notes: 1. All growth rates in percent/year.
2. Wild cards may be used for both region and ind cat IDs.

Figure 5-7. Example Growth Rate Sheets (continued).



Growth Rates File:GROWTH.DAT Sheet 3 of 3

Region ID :1 :
Covering Period with Ending Year:1995:

Ind Cat ID	Growth	Ind Cat ID	Growth	Ind Cat ID	Growth
:A	:20 :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :

Notes: 1. All growth rates in percent/year.
2. Wild cards may be used for both region and ind cat IDs.

Figure 5-7. Example Growth Rate Sheets (continued).

Retirement Rates File:RETIRE.DAT Sheet 1 of 1

Ind Cat ID	Rate	Ind Cat ID	Rate	Ind Cat ID	Rate
A	5				

Notes: 1. All retirement rates in percent/year.
2. Wild cards may be used.

Figure 5-8. Example Retirement Rate Sheet.

```
Control Cost Table                    File:COST.DAT       Sheet 1    of 1

Table Name  :Control costs for Industry A                                  :
Ind Cat IDs :A                                                            :
            :                                                             :
            :                                                             :
              (ID's  separated by spaces or commas, wild cards may be used)



 Ctrl Eff    CE          Ctrl Eff    CE          Ctrl Eff    CE
  (prct)   ($/ton)         (prct)   ($/ton)         (prct)   ($/ton)
:30       :150      :    :60       :300      :    :90       :800      :  (Table in
:         :         :    :         :         :    :         :         :   any order)
:         :         :    :         :         :    :         :         :
:         :         :    :         :         :    :         :         :

Priority : : (integer) (0=low,9=high - model chooses highest when appl overlap)
```

Figure 5-9. Example Control Cost Sheet.

Appendix A
VOCM'S DATA FILE SHEETS

Depictions of VOCM's eight data file sheets are presented in this appendix along with descriptions of the fields on each sheet.

THE GLOBAL FILE SHEET (Figure A-1)

Fraction of New Emissions in Attn Areas: The percent of new emissions that will be in attainment areas. For example, if 40 percent of new emissions will be in attainment areas, enter 40. The default value is the percent of base year emissions that is in attainment areas. Leave this field blank if you wish new emissions growth to occur in the same proportion as the base year emissions.

General Growth Rate: The annual growth rate you want VOCM to use for sectors not included in the GROWTH.DAT file. Express the growth as a percent; for example enter 10 for ten percent growth. The default value is 0 (zero) percent.

General Retirement Rate: The annual retirement rate you want VOCM to use for industrial categories not included in the RETIRE.DAT file. Express the retirement rate as a percent; for example enter 10 for ten percent retirement per year. The default value is 5 percent.

Base Year: The calendar year of the emissions data in the EMIS.DAT file. These are the emissions that will be projected; therefore, the year of these emissions is the base year of the projection. The default value is 1980.

Printer Specification (or DOS file): If you want VOCM's output to be sent to your printer, enter the DOS name for your printer (e.g., if your printer is connected to the first parallel port of your computer, enter "LPT1:" or "PRN:"). If you want VOCM's output sent to a DOS file, enter the name of the file. (See your DOS manual for details about DOS file-naming conventions and for more information about reserved names for system

```
Volatile Organic Compound Model (VOCM)
Global Data

Fraction of New Emissions in Attn Areas   :       : (prct) (def=base yr frac)
General Growth Rate                       :       : (prct) (def=0)
General Retirement Rate                   :       : (prct) (def=5)
Base Year (year of data in EMIS.DAT)      :   :     (e.g., 1980)
Printer Specification (or DOS file)       :           : (e.g., LPT1:, CON:)
Data Disk Drive Identifier                : :  (e.g., A, B, C, etc.)
Abbreviated Screen Display (Y/N) ?        : :  (def=N)
Require Existing Level of Control (Y/N) ? : :  (def=N)
Aggregate Results (Y/N) ?                 : :  (def=N)
Sort Results by Cat ID (Y/N) ?            : :  (def=N)
Run Cost Analysis (Y/N) ?                 : :  (def=N)
Output Results Desired (Y/N) ?
   Input Data Summary Tables              : :
   Year by Year Proj Emission Tables      : : (not recmnd for complex runs)
   Listing of Constraints                 : : (not recmnd for complex runs)
   Emission Segment Tables                : : (not recmnd for complex runs)
   Regional Emission Projection Details   : : (don't combine with three prev)
   Regional Emission Projection Results   : :
   Overall Emission Projection Results    : :
Note:  Only first sheet in this file is recognized.
```

Figure A-1. Global File Sheet.

devices.) NOTE: Whenever VOCM is started, it initializes the printer or disk file. If you have entered a DOS file name in the printer specification, this initialization will cause any existing file with this file name to be erased and a new file created. Thus, you should always rename (or move to a different directory) any disk file you wish to save from a previous analysis before re-starting VOCM for another analysis.

Data Disk Drive Identifier: The identifier (e.g., "A", "B", "C", etc.) of the disk drive where you will keep the diskette(s) that contain the VOCM input data files. For two-floppy systems, this will usually be B. For hard-disk systems, this will usually be C. If you wish to keep the data files in the default directory of the default disk, you can leave this field blank.

Abbreviated Screen Display (Y/N)?: Enter Y for yes if you want to abbreviate the screen messages occurring during an analysis. Doing so will suppress the listing on the screen of the current region and industry being processed and will make the projection up to 30 percent faster for complex projections.

Require Existing Level of Control (Y/N)?: Enter Y for yes if you wish the base year level of control (as established by the base year uncontrolled and controlled emissions) to be automatically required of all new/replaced emissions which come on-line after the base year. Doing so establishes an "implicit constraint" requiring at least the base year level of control for all new/replaced emissions. Regardless of how you set this field, the base year level of control always applies to all base year emissions still existing in the projection year.

Aggregate Results (Y/N)?: Enter Y for yes to indicate whether you want the projection results to be aggregated over certain categories according to data you have entered in the AGG.DAT file. If you specify that you wish aggregation to be performed, then the AGG.DAT file must be available.

Sort Results by Cat ID (Y/N)?: Enter Y for yes to indicate whether you want the projection results to be put in alphabetical order by industrial category ID. Keep in mind that all regional

and industrial identifiers in VOCM are treated as character identifiers rather than numeric identifers. Thus, the identifier "10" will be sorted prior to the identifer "2" since the character "1" occurs prior to the character "2". If you use a simple ascending numeric classification scheme for industrial categories (e.g., 1,2,3,...) you should not use this sorting option; instead make sure the order of your data in the emissions file reflects the order you wish your data to be sorted in your final outputs.

Run Cost Analysis (Y/N)?: Enter Y for yes to indicate whether you want a cost analysis performed. If you specify that you wish to run a cost analysis, then the COST.DAT file must be available.

Output Results Desired (Y/N)?: Enter Y for yes to indicate the output type(s) that you want VOCM to generate. Appendix B (VOCM's Output) describes each type of output. Three output types (marked "not recmnd for complex runs") should be run only in limited test case runs as large amounts of output are generated. Also, you shouldn't request the Regional Emission Projection Details output at the same time that you obtain any of the three output types listed before it. If you do, each line of the Regional Emission Projection Details table will be fragmented across other tables.

THE EMISSIONS FILE SHEET (Figure A-2)

Region ID: The code or name that uniquely identifies the region for all data on the sheet. The ID can contain any characters (except spaces and commas) and be up to ten characters long. Wild cards are not allowed.

Comment: Any comment you want to include. For example, you might want to include a description of the region.

Ind Cat ID: The code or name that uniquely identifies the industrial category. The ID can contain any characters (except spaces and commas) and be up to ten characters long. Wild cards are not allowed. Each EMIS.DAT file sheet contains ten "Ind Cat ID" fields. If a particular region has more than ten industrial

Volatile Organic Compound Model (VOCM)
Emission Data

Region ID: :
Comment : :

Ind Cat ID	Unc-A	Ctr-A	Unc-NA	Ctr-NA
:	:	:	:	:
:	:	:	:	:
:	:	:	:	:
:	:	:	:	:
:	:	:	:	:
:	:	:	:	:
:	:	:	:	:
:	:	:	:	:
:	:	:	:	:
:	:	:	:	:

Notes: 1. All data in tons/year.
2. Wild cards may not be used.
3. A region may have multiple sheets in any order.

Figure A-2. Emissions File Sheet.

categories, continue the emission data for that region on one or more additional sheets, being sure to use the same Region ID on the subsequent sheets.

Unc-A: The level of uncontrolled emissions (expressed in tons/year) in the base year in the region's attainment areas.

Ctr-A: The level of controlled emissions (expressed in tons/year) in the base year in the region's attainment areas.

Unc-NA: The level of uncontrolled emissions (expressed in tons/year) in the base year in the region's non-attainment areas.

Ctr-NA: The level of controlled emissions (expressed in tons/year) in the base year in the region's non-attainment areas.

THE CONSTRAINT FILE SHEET (Figure A-3)

Name: The name of the constraint; for example, "NSPS for Magnet Wire Coating" or "SIP for Kentucky". This field can contain any characters. It is for your information only - it will not affect how VOCM runs.

Region IDs: A list of the IDs of all the regions that are affected by the constraint. Separate the IDs with commas or spaces. Use wild cards to indicate multiple IDs or enter "ALL" (or "all") to indicate that the constraint is applicable to all regions.

Ind Cat IDs: A list of the IDs of all the industrial categories that are affected by the constraint. Separate the IDs with commas or spaces. Use wild cards to indicate multiple IDs or enter "ALL" (or "all") to indicate that the constraint is applicable to all industrial categories.

Beg Year: The calendar year (e.g., "1987") when the constraint takes first effect. The constraint will be in effect for all of the calendar year (January through December) that you specify; it will not be in effect prior to this year.

Target Year: The calendar year that affected emissions are expected to be in complete compliance with the constraint. Constraints are "ramped" linearly from the beginning year to the target year. By setting the target year different from the

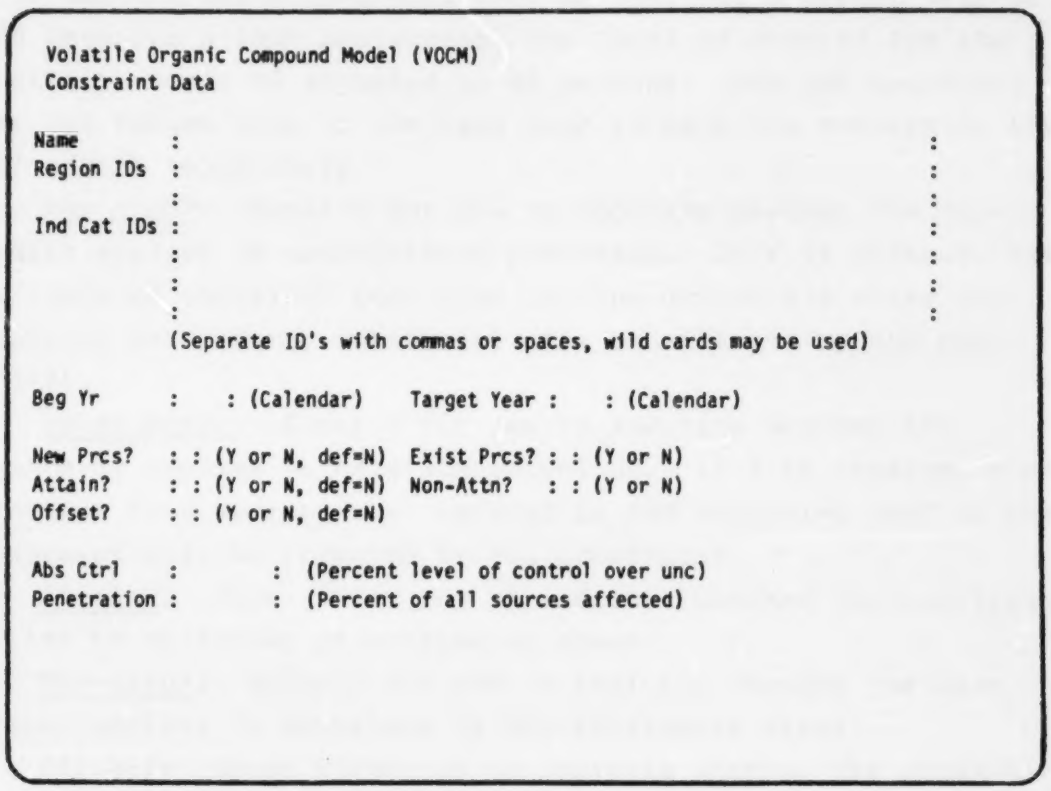

Volatile Organic Compound Model (VOCM)
Constraint Data
Name :
Region IDs :
Ind Cat IDs :
(Separate ID's with commas or spaces, wild cards may be used)
Beg Yr : : (Calendar) Target Year : : (Calendar)
New Prcs? : : (Y or N, def=N) Exist Prcs? : : (Y or N)
Attain? : : (Y or N, def=N) Non-Attn? : : (Y or N)
Offset? : : (Y or N, def=N)
Abs Ctrl : : (Percent level of control over unc)
Penetration : : (Percent of all sources affected)

Figure A-3. Constraint File Sheet.

beginning year, the level of control of the constraint is interpolated from zero to the level specified in the constraint for projection years between the beginning year and the target year. For example, if a constraint requiring a level of control of 80 percent has a beginning year of 1980 and a target year of 2000 then for a 1990 projection, the level of control for the constraint would be adjusted to 40 percent. Set the beginning year and target year to the same year to have the constraint take full effect immediately.

New Prcs?: Enter Y for yes to indicate whether the constraint applies to new/replaced processes. If Y is entered, then new/replaced emissions that come on-line during and after the beginning year of the constraint will be affected by the constraint.

Exist Prcs?: Enter Y for yes to indicate whether the constraint applies to existing emissions. If Y is entered, then emissions from sources that existed in the beginning year of the constraint will be affected by the constraint.

Attain?: Enter Y for yes to indicate whether the constraint applies to emissions in attainment areas.

Non-Attn?: Enter Y for yes to indicate whether the constraint applies to emissions in non-attainment areas.

Offset?: Enter Y for yes to indicate whether the constraint is an offset constraint. Offset constraints require that an additional emission offset be obtained by all sources affected by the constraint. The offset level and year when offsets are applied must be entered into the rollback/offset file for each region with offset constraints. The beginning and target years are ignored for offset constraints; instead the offset year entered in the rollback/offset file is used as the beginning year of the constraint.

Abs Ctrl: The absolute level of control (over uncontrolled) required by the constraint - that is, the percent reduction in uncontrolled emissions that the constraint requires.

Penetration: The percent of emissions that is affected by the constraint. This value can be used to account for regulation size cutoffs, regulations that cover only a portion of the industrial category, etc.

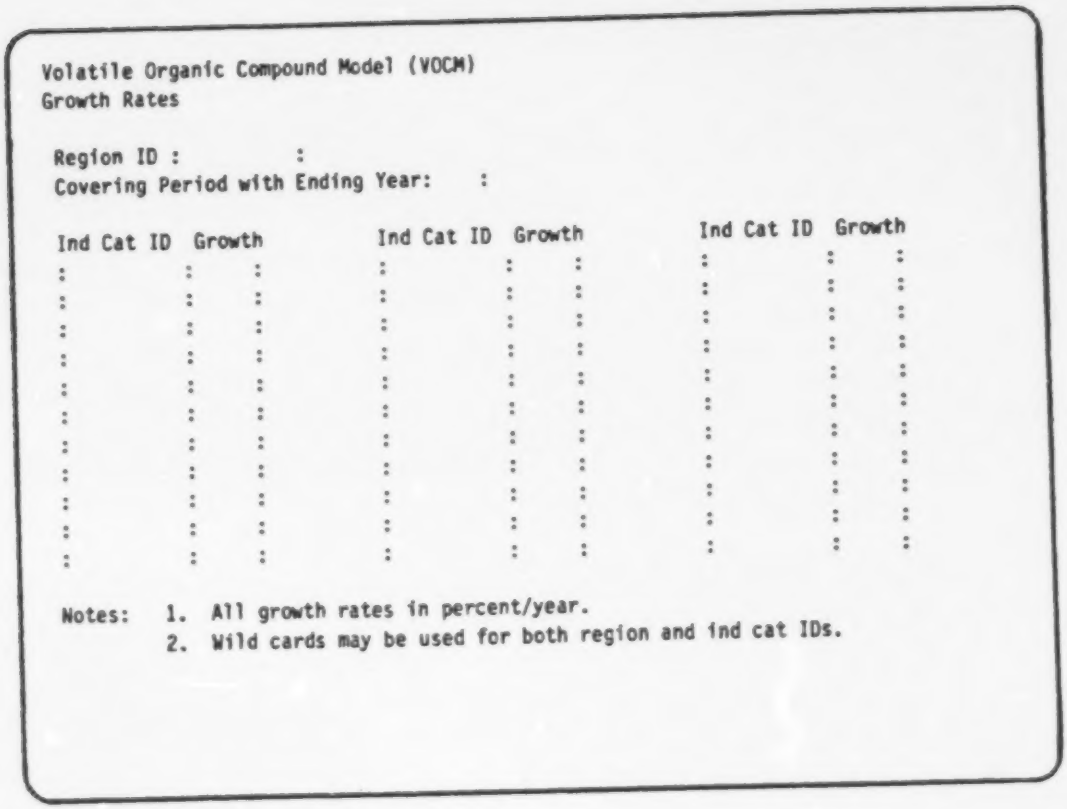
THE GROWTH FILE SHEET (Figure A-4)

Region ID: The code or name that uniquely identifies the region. The ID can contain any characters (except spaces and commas) and be up to ten characters long.

Covering Period With Ending Year: The last year of the period for which the growth rate(s) listed on the sheet is (are) to be used. Example: For the period from the base year through 1985, the growth rate for several industrial categories in a particular region is expected to be 10 percent; for the period from 1986 through 1990, the growth rate for these categories is expected to be 15 percent. On the first GROWTH.DAT sheet for the region, enter "1985" in this field and "10" in the growth fields for each industrial category. Then on a second sheet for this same region, enter "1990" in this field and "15" in the Growth fields for each industrial category.

Ind Cat ID: The code or name that uniquely identifies the industrial category. The ID can contain any characters (except spaces and commas) and be up to ten characters long. Each GROWTH.DAT file sheet contains 33 "Ind Cat ID" fields. If a particular region has more than 33 industrial categories, continue the growth rate data for that region on one or more additional sheets, being sure to use the same Region ID for subsequent sheets.

Growth: The annual percent increase in emissions that is expected for the industrial category in the region. NOTE: If you leave the Growth field blank, VOCM uses 0.0 (zero) as the growth rate. To have the general growth rate (specified on the GLOBAL.DAT file sheet) be used for a particular industrial category, you must not include the ID of that industrial category on a GROWTH.DAT file sheet.



Volatile Organic Compound Model (VOCM)
Growth Rates

Region ID : :
Covering Period with Ending Year: :

Ind Cat ID	Growth	Ind Cat ID	Growth	Ind Cat ID	Growth
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :
:	: :	:	: :	:	: :

Notes: 1. All growth rates in percent/year.
2. Wild cards may be used for both region and ind cat IDs.

Figure A-4. Growth Rate File Sheet.

THE RETIREMENT RATE FILE SHEET (Figure A-5)

Ind Cat ID: The code or name that uniquely identifies the industrial category. The ID can contain any characters (except spaces and commas) and be up to ten characters long. Each RETIRE.DAT file sheet contains 27 "Ind Cat ID" fields. Use additional sheets to enter the retirement rate data for more than 27 categories.

Rate: The percent of the industrial category's capacity that is expected to be retired and replaced each year. NOTE: If you leave the Rate field blank, VOCM uses 0.0 (zero) as the retirement rate. To have the general retirement rate (specified on the GLOBAL.DAT file sheet) be used for a particular industrial category, you must not include the ID of that industrial category on a RETIRE.DAT file sheet.

THE COST FILE SHEET (Figure A-6)

Table Name: The name of the control cost table (e.g., "Control Costs for VOC Emissions from Rotogravure Printing"). This field can contain any characters. It is for your information only - it will not affect how VOCM runs.

Ind Cat IDs: A list of the IDs of all the industrial categories to which the cost table applies. Separate the IDs with commas or spaces. Use wild cards to indicate multiple IDs or enter "ALL" (or "all") to indicate that the costs are applicable to all categories.

Ctrl Eff and CE: The Ctrl Eff (Control Efficiency) and CE (Cost Effectiveness) fields make up the "cost table." Each Ctrl Eff and CE pair defines a point on a cost curve relating total (not incremental) cost effectiveness to control efficiency. There are twelve pairs of fields, allowing you to specify up to twelve points. The points do not have to be entered in order of increasing control efficiency; they can be entered in any order. If there is a cost credit, negative cost effectiveness values can be entered.

Volatile Organic Compound Model (VOCM)
Retirement Rates

Ind Cat ID	Rate	Ind Cat ID	Rate	Ind Cat ID	Rate

Notes: 1. All retirement rates in percent/year.
2. Wild cards may be used.

Figure A-5. Retirement Rate File Sheet.

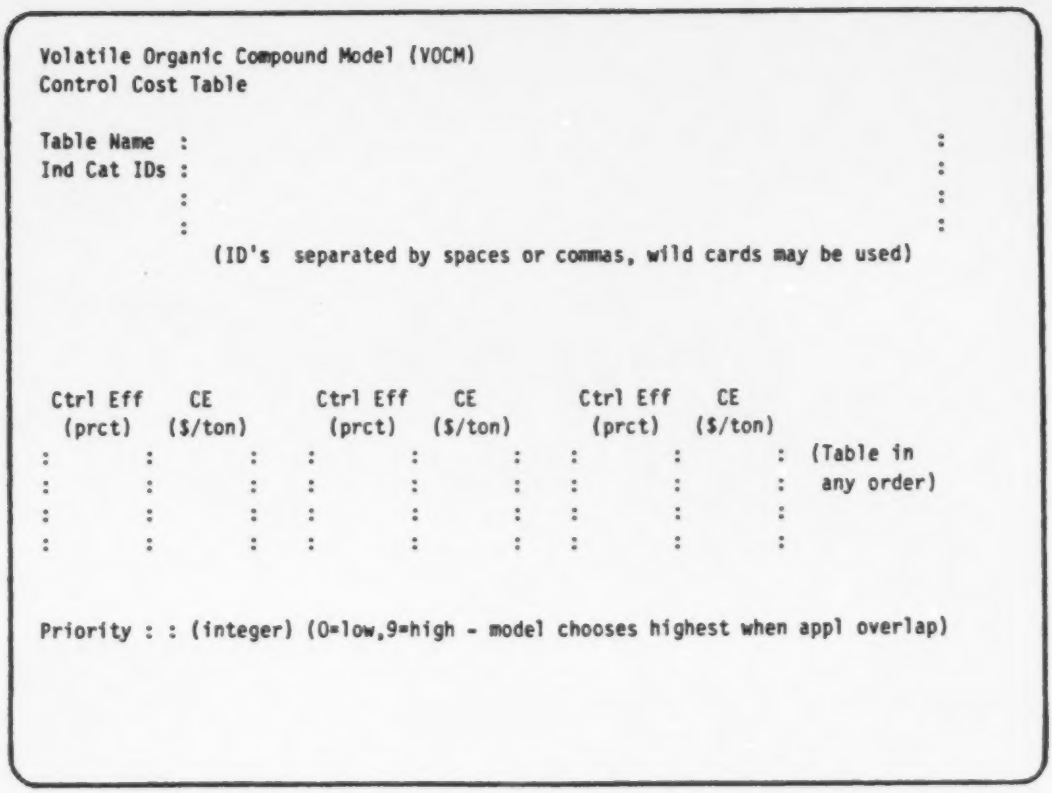

Volatile Organic Compound Model (VOCM)
Control Cost Table
Table Name :
Ind Cat IDs :
(ID's separated by spaces or commas, wild cards may be used)
Ctrl Eff (prct)
CE ($/ton)
Ctrl Eff (prct)
CE ($/ton)
Ctrl Eff (prct)
CE ($/ton)
(Table in any order)
Priority : : (integer) (0=low,9=high - model chooses highest when appl overlap)

Figure A-6. Cost File Sheet.

VOCM searches this table to determine a cost effectiveness value for any particular control efficiency in the projection year. A step function interpolation is used where VOCM selects the lowest efficiency in the table that is equal to or higher than the efficiency computed in the projection year. For example, if a cost table has values for 30, 60, and 90 percent efficiency and the reported control efficiency in the projection year is 40 percent, VOCM would use the cost effectiveness value for 60 percent efficiency. If the control efficiency exceeds all values in the table, the highest value in the table is used.

Priority: Enter an integer from 0 (low priority) to 9 (high priority) to indicate the priority of the cost table. The highest priority cost table will be used when two or more tables are applicable to the same industrial category. If you do not enter any priority, it defaults to the lowest priority (0).

THE AGGREGATION FILE SHEET (Figure A-7)

Aggregate ID: The code or name under which you want the aggregated projection results to be reported. The ID can include any characters (except spaces and commas) and be up to ten characters long.

Comment: Any comment you want to make about the aggregation category.

Ind Cat IDs to include in above cat: A list of the IDs of all industrial categories for which you want the projection results aggregated. You may include wild cards. NOTE: If you specify that you want projection results aggregated and VOCM cannot locate an aggregate ID for an industrial category ID, then VOCM will report the results for this category under the industrial category ID.

THE ROLLBACK/OFFSET FILE SHEET (Figure A-8)

Region ID: The regional identifer for the region.

RB Yr: The rollback year upon which a emission cap on all future projection years is based.

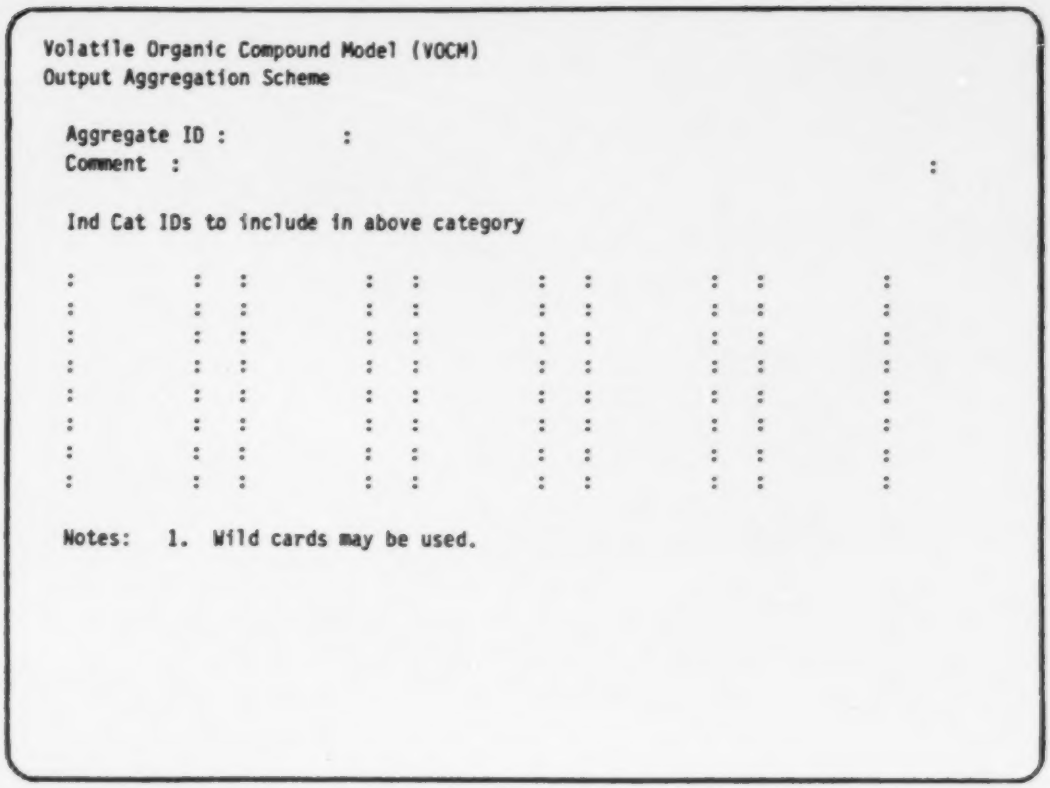

Volatile Organic Compound Model (VOCM)
Output Aggregation Scheme
Aggregate ID :
Comment :
Ind Cat IDs to include in above category
Notes: 1. Wild cards may be used.

Figure A-7. Aggregation File Sheet.

Volatile Organic Compound Model (VOCM)
Emission Rollbacks and Offsets

Region ID	RB Yr	RB Level	Off Yr	Off Level

Notes:
1. Any region may have either a rollback or offset or both.
2. Rollback level establishes an emission cap on projected emissions expressed as a percentage of projected emissions in the rollback yr.
3. Offset level is the additional reduction in controlled emissions required, expressed as a percentage of new controlled emissions.

Figure A-8. Rollback/Offset File Sheet.

RB Level: The rollback level expressed as a percentage of emissions in the rollback year. All projection years subsequent to the rollback year will have controlled emissions capped to the product of the rollback year emissions times the rollback level.

Off Yr: The offset year when offset provisions for the region are routinely required. This year is used as the beginning and target years for all offset constraints in the region.

Off Level: The required offset level expressed as a percentage reduction above and beyond the controlled emissions required in an offset constraint. For example, an offset level of 20 percent indicates that sources must obtain an offset of their controlled emissions plus 20 percent additional reduction.

Appendix B
VOCM'S OUTPUT

This appendix provides a description of each output that a VOCM user can request. The sample output shown in this appendix is based on the example given in Chapter 5 ("Running a Projection").

INPUT DATA SUMMARY (Figure B-1)

The Input Data Summary provides a record of all data in VOCM's data files used for a projection. The contents of the COST.DAT file are printed only when a cost analysis is performed. The contents of the AGG.DAT file are printed only when the projection results are aggregated.

Summary of All Constraints Table

This table is a listing of all constraints in the CONSTRNT.DAT file. The column headings are as follows:

No	The sheet number of the constraint.
Name	The first 20 characters of name field of the constraint.
Region IDs	The first 32 characters of the Region IDs field of the constraint.
Ind Cat IDs	The first 32 characters of the Ind Cat IDs field of the constraint.
Beg	The beginning calendar year of the constraint.
Targ	The target calendar year of the constraint.
N	Whether the constraint applies to new/replaced emissions.
E	Whether the constraint applies to existing emissions.
A	Whether the constraint applies to attainment areas.

Summary of All Constraints

No	Name	Region IDs	Ind Cat IDs	Beg	Targ	N	E	A	N	O	A Ctr	Pentr
1	NSPS affecting new/	1	A	1982	1982	T	F	T	T	F	90.0	100.0
2	SIP affecting all e	1	A	1984	1984	T	T	F	T	F	80.0	50.0

Summary of All Retirement Rates

Ind Cat ID	Rate
A	5.0

Summary of All Emission Data

Ind Cat ID	Unc-A	Ctr-A	Unc-NA	Ctr-NA	Ind Cat ID	Unc-A	Ctr-A	Unc-NA	Ctr-NA
Region ID = 1									
A	400.	200.	600.	300.					

Summary of Rollback/Offset Data

Region ID	RB Yr	RB Level	Off Yr	Off Level

Figure B-1. Input Data Summary.

Summary of All Cost Tables

No	Table Name	Ind Cat IDs	Eff(%)	C($/t)	P
1	Control costs for Industry A	A	30.0	150.	0
			60.0	300.	
			90.0	800.	

Summary of All Growth Rates for Region 1

End Year	Growth
Ind Cat ID = A	
1982	10.0
1985	15.0
1995	20.0

Figure B-1. Input Data Summary (continued).

N	Whether the constraint applies to non-attainment areas.
O	Whether the constraint is an offset constraint.
A Ctr	The absolute level of control of the constraint in percent.
Pentr	The penetration of the constraint in percent.

Summary of All Retirement Rates Table

This table provides a summary of all retirement rates in the RETIRE.DAT file. The column headings are as follows:

Ind Cat ID	The industrial category ID.
Rate	The annual retirement rate in percent.

Summary of All Emissions Data Table

This table provides a summary of all base year emissions data in the EMIS.DAT file. The columns headings are as follows:

Ind Cat ID	The industrial category ID.
Unc-A	The uncontrolled attainment area emissions for the base year (tons/yr).
Ctr-A	The controlled attainment area emissions for the base year (tons/yr).
Unc-NA	The uncontrolled non-attainment area emissions for the base year (tons/yr).
Ctr-A	The controlled non-attainment area emissions for the base year (tons/yr).

Summary of Rollback/Offset Data Table

This table provides a summary of the rollback and offset data in the ROLLOFF.DAT file. The column headings are as follows:

Region ID	The regional identifier for the region.
RB Yr	The rollback calendar year.
RB Level	The rollback level in percent.
Off Yr	The offset calendar year.
Off Level	The offset level in percent.

Summary of All Cost Tables Table

This table provides a summary of all cost tables in the COST.DAT file. The column headings are as follows:

No	The sheet number of the cost table.
Table Name	The first 28 characters of the table name field on the cost table sheet.
Ind Cat IDs	The first 50 characters of the Ind Cat IDs field on the cost table sheet.
Eff(%)	The percent control efficiency for a cost table point.
C($/t)	The cost effectiveness in $/ton for a cost table point.
P	The priority of the cost table.

Summary of All Growth Rates Table

This table provides a summary of all growth rates used in an analysis. The growth rates are grouped by industrial category ID. The column headings are as follows:

End Year	The ending year for the growth rate period.
Growth	The growth rate for the period in percent per year.

YEAR BY YEAR PROJECTED EMISSION TABLES (Figure B-2)

This output provides a detailed year by year report of the uncontrolled emission projection for attainment and non-attainment areas within each sector. Because two of these tables are generated for every sector in an analysis (one for attainment areas and one for non-attainment areas), this output is not usually generated except to examine a sector's projection in detail.

The two header lines at the beginning of the table provide information on the sector (region ID and industrial category ID), whether the table covers the attainment or non-attainment area projection, and the default retirement rate used. Also included

Year by Year Projected Emissions for Region 1, Industrial Category A, Attainment
Retirement Rate = 5.0 Percent, Frac of New Emissions = 40.0 Percent

Year	A+NA Emis (tons/yr)	Attn Emis (tons/yr)	Growth Rt (percent)	A+NA Chg (tons/yr)	Attn Chg (tons/yr)
1980	1000.	400.	10.00	100.	40.
1981	1100.	440.	10.00	110.	44.
1982	1210.	484.	15.00	182.	73.
1983	1392.	557.	15.00	209.	83.
1984	1600.	640.	15.00	240.	96.
1985	1840.	736.	20.00	368.	147.
1986	2208.	883.	20.00	442.	177.
1987	2650.	1060.	20.00	530.	212.
1988	3180.	1272.	20.00	636.	254.
1989	3816.	1526.	20.00	763.	305.
1990	4579.	1832.			

Year by Year Projected Emissions for Region 1, Industrial Category A, Non-Attainment
Retirement Rate = 5.0 Percent, Frac of New Emissions = 60.0 Percent

Year	A+NA Emis (tons/yr)	NA Emis (tons/yr)	Growth Rt (percent)	A+NA Chg (tons/yr)	NA Chg (tons/yr)
1980	1000.	600.	10.00	100.	6).
1981	1100.	660.	10.00	110.	66.
1982	1210.	726.	15.00	182.	109.
1983	1392.	835.	15.00	209.	125.
1984	1600.	960.	15.00	240.	144.
1985	1840.	1104.	20.00	368.	221.
1986	2208.	1325.	20.00	442.	265.
1987	2650.	1590.	20.00	530.	318.
1988	3180.	1908.	20.00	636.	382.
1989	3816.	2290.	20.00	763.	458.
1990	4579.	2747.			

Figure B-2. Year by Year Projected Emissions.

is the fraction of new emissions that were projected for the attainment or non-attainment portions of the sector based on the "Fraction of New Emissions in Attn Areas" field of the GLOBAL.DAT file.

The table itself is a year by year account of the uncontrolled emissions in the year and the change from year to year. This table forms the basis of the constraint analysis as it provides the uncontrolled projected emissions for every year during the projection prior to the application of constraints. The column headings are as follows:

Year	The calendar year.
A+NA Emis	The total uncontrolled emissions for the sector at the beginning of the year including both attainment and non-attainment area emissions. This number is used to compute the total emissions growth during the year for the sector.
Attn/NA Emis	The uncontrolled emissions for the attainment or non-attainment portion of the sector, depending on which portion the table describes.
Growth Rt	The growth rate for the year.
A+NA Chg	The total change in uncontrolled emissions for the sector computed from the total A+NA emissions and the growth rate.
Attn/NA Chg	The total change in uncontrolled emissions for the year for the attainment or non-attainment portion of the sector, depending on which portion the table describes. This number is added to the emissions at the beginning of the year to arrive at the beginning emissions for the next year.

LISTING OF CONSTRAINTS (Figure B-3)

This output provides a detailed listing of all constraints that apply to any given sector. Because two of these tables are generated for every sector in an analysis (one for attainment areas and one for non-attainment areas), this output is not

Constraint Table for Region 1, Industrial Category A, Attainment

Constrt Sht Num	Beg Yr	Target Yr	Off Level (percent)	LOC (percent)	Penetra (percent)	Appl Ex?	Appl New?	C Yr Tot (tons/yr)	P Yr Ex (tons/yr)	P Yr New (tons/yr)
0	1980	1980	-100.00	50.00	100.00	TRUE	TRUE	400.	200.	1632.
1	1982	1982	-100.00	90.00	100.00	FALSE	TRUE	484.	290.	1541.

Constraint Table for Region 1, Industrial Category A, Non-Attainment

Constrt Sht Num	Beg Yr	Target Yr	Off Level (percent)	LOC (percent)	Penetra (percent)	Appl Ex?	Appl New?	C Yr Tot (tons/yr)	P Yr Ex (tons/yr)	P Yr New (tons/yr)
0	1980	1980	-100.00	50.00	100.00	TRUE	TRUE	600.	300.	2447.
1	1982	1982	-100.00	90.00	100.00	FALSE	TRUE	726.	436.	2312.
2	1984	1984	-100.00	80.00	50.00	TRUE	TRUE	960.	672.	2075.

Figure B-3. Listing of Constraints.

usually generated except to examine a sector's projection in detail.

Each line in the table represents a separate constraint applicable to the sector. The lines are ordered in ascending order with respect to the beginning year of the constraint.

An extra constraint is always included as the first constraint in the table and is given a sheet number of zero. This constraint is the existing level of control constraint. It requires that all projection year emissions that existed in the base year continue the same level of control. Additionally, if you have indicated that you require all new/replaced sources to also meet the existing level of control, then this constraint will be applicable to all new/replaced sources as well.

The columns headings in the table are as follows:

Constrt Sht Num	The sheet number for the constraint.
Beg Yr	The beginning year of the constraint.
Target Yr	The target year of the constraint.
Off Level	The offset level for the constraint in percent. If the constraint is not marked as an offset constraint then the offset level will be -100 percent, which corresponds to not requiring sources to obtain any offset.
LOC	The absolute level of control specified in the constraint in percent.
Penetra	The penetration level specified in the constraint in percent.
Appl Ex?	Whether the constraint applies to emissions that exist in the beginning year of the constraint.
Appl New?	Whether the constraint applies to new/replaced emissions that come on-line after the beginning year of the constraint.
C Yr Tot	The uncontrolled emissions in the beginning year of the constraint. This number is identical to the uncontrolled emissions

	reported for the constraint beginning year as listed in the year by year emissions table.
P Yr Ex	The uncontrolled emissions in the projection year that existed prior to the beginning year of the constraint. This is the portion of the emissions in the projection year that have not been replaced since the constraint took effect.
P Yr New	The uncontrolled emissions in the projection year that did not exist prior to the beginning year of the constraint. This is the portion of the emissions in the projection year that are the result of new emissions growth or replacement of existing emissions.

EMISSION SEGMENT TABLES (Figure B-4)

This output provides a detailed report of the segment analysis conducted by VOCM for each sector. Because two of these tables are generated for every sector in an analysis (one for attainment areas and one for non-attainment areas), this output is not usually generated except to examine a sector's projection in detail.

Each line of the table represents an emissions "segment" (a segment is a portion of the total projected uncontrolled emissions that are subject to a unique set of constraints). The timing of various constraints establishes the number of different segments in a sector's emissions.

The column headings are as follows:

Segment Number	A sequential number assigned to each segment.
Seg Emis	The uncontrolled emissions for the segment. This number represents the increment increase in projection year existing emissions in the constraint table.

Segment Table for Region 1, Industrial Category A, Attainment

Segment Number	Seg Emis (tons/yr)	Applicable Constraints	Agg LOC (percent)	Constr Em (tons/yr)
1	200.	0	50.00	100.
2	90.	0	50.00	45.
3	1541.	0 1	90.00	154.

Total Constrained Emissions = 299.

Segment Table for Region 1, Industrial Category A, Non-Attainment

Segment Number	Seg Emis (tons/yr)	Applicable Constraints	Agg LOC (percent)	Constr Em (tons/yr)
1	300.	2 0	65.00	105.
2	136.	2 0	65.00	47.
3	236.	2 0 1	90.00	24.
4	2075.	2 0 1	90.00	208.

Figure B-4. Emission Segment Tables.

Applicable Constraints	The sheet numbers of all constraints applicable to the segment.
Agg LOC	The aggregate level of control for the segment in percent. This number represents the overall level of control computed for the segment based on the levels of control and penetrations of the applicable constraints.
Constr Em	The constrained emissions for the segment computed from the segment emissions and the aggregate level of control.

REGIONAL EMISSION PROJECTION DETAILS (Figure B-5)

This output provides summary details for each region in an analysis. One table is generated for each region with each line of the table representing an industrial category represented in the region.

The column headings are as follows:

Ind Cat ID	The industrial category identifer.
Retire Rate	The retirement rate in percent used for the projection as found in the RETIRE.DAT file. If the industrial category could not be found in the RETIRE.DAT file, then the default in the GLOBAL.DAT file is used.
Overall Grth-Attn	The overall annual growth rate for attainment area uncontrolled emissions in percent. Although the actual growth rates used may vary during the projection period, this rate represents the annual constant growth rate that would be required to arrive at the projection year emissions from the base year emissions.
Overall Grth-NA	The overall annual growth rate for non-attainment area uncontrolled emissions in

Details of Emission Projection for Region 1
Radian/EPA Volatile Organic Compound Model (VOCM) - Version 1.8 - 6/23/87 - Time of Run: 12:06 PM, Monday September 21, 1987
Defaults: Growth = 0.0 % Retire Rate = 5.0 % Attn Fraction = Base Yr Fraction

Ind Cat ID	Retire Rate	Overall Grth-Attn	Overall Grth-NA	Attn Fraction	No Appl Constr	Special Notes
A	5.0	16.4	16.4	40.0	2	

Figure B-5. Regional Emission Projection Details.

percent. Although the actual growth rates used may vary during the projection period, this rate represents the annual constant growth rate that would be required to arrive at the projection year emissions from the base year emissions.

Attn Frac — The percentage of new emission growth that occurred in attainment areas.

No Appl Constr — The total number of constraints (not including the existing level of control constraint) applicable to emissions in the sector.

Special Notes — Special notes codes to indicate potential problems or options which you should be aware:

1 = A constraint for the sector was missing a control level.

2 = No growth rate was found for the sector in the GROWTH.DAT file; the default in the GLOBAL.DAT file was used.

3 = No retirement rate was found for the sector in the RETIRE.DAT file; the default in the GLOBAL.DAT file was used.

4 = No cost table was found for the industrial category; zero cost was assumed.

5 = More than one cost table was found for the industrial category; the table with the highest priority was used. If the priorities were equal, the first table in the file was used.

6 = An offset constraint was invoked in the constraint analysis but no offset year or level was found for the region in the

ROLLOFF.DAT file; the constraint was ignored.

7 = An offset constraint caused the total emissions for the sector to be negative; the emissions were set to zero.

8 = An emission rollback caused emissions for the sector to be rolled back to a level less than the projected emissions.

REGIONAL EMISSION (AND COST) PROJECTION RESULTS (Figure B-6)

This output provides a summary of all emissions (and costs if a cost analysis is requested on the GLOBAL.DAT sheet) for a region. One emissions table is generated for each region with each line of the table representing an industrial category. If aggregation is requested on the GLOBAL.DAT sheet, then the industrial categories listed represent aggregated categories. If a cost analysis is requested, a companion table is generated for costs.

The emissions table consists of four main items. The left column is the industrial category. The middle two column groups provide emissions and level of controls for the base year and the projection year respectively. The right column provides the change in controlled emissions between the base year and the projection year. The column headings for the emissions table are as follows:

Ind Cat ID	The industrial category identifier.
Unc Attn	The uncontrolled emissions for attainment areas.
Ctr Attn	The controlled emissions (after constraints) for non-attainment areas.
Unc NA	The uncontrolled emissions for non-attainment areas.
Ctr NA	The controlled emissions (after constraints) for non-attainment areas.

Results of Emission Projection for Region 1
Radian/EPA Volatile Organic Compound Model (VOCM) - Version 1.8 - 6/23/87 - Time of Run: 12:06 PM, Monday September 21, 1987
Defaults: Growth = 0.0 % Retire Rate = 5.0 % Attn Fraction = Base Yr Fraction

Ind Cat ID	Base Year = 1980						Proj Year = 1990						
	Unc Attn	Ctr Attn	Unc NA	Ctr NA	Tot Ctr	LOC	Unc Attn	Ctr Attn	Unc NA	Ctr NA	Tot Ctr	LOC	%Chg
A	400	200	600	300	500	50.0	1832	299	2747	384	683	85.1	36.6
	400	200	600	300	500	50.0	1832	299	2747	384	683	85.1	36.6

Results of Cost Analysis for Region 1
Radian/EPA Volatile Organic Compound Model (VOCM) - Version 1.8 - 6/23/87 - Time of Run: 12:06 PM, Monday September 21, 1987
Defaults: Growth = 0.0 % Retire Rate = 5.0 % Attn Fraction = Base Yr Fraction

Ind Cat ID	Base Year = 1980			Proj Year = 1990				
	Cost	Emis Red	Cost Eff	Cost	Emis Red	Cost Eff	Abs Chg	Prct Chg
A	150000.	500.	300.	3116942.	3896.	800.	2966942.	1978.0
	150000.	500.	300.	3116942.	3896.	800.	2966942.	1978.0

Figure B-6. Regional Emission (and Cost) Projection Results

Tot Ctr	The total controlled emissions for both attainment and non-attainment areas.
LOC	The level of control for both attainment and non-attainment areas.
%Chg	The percentage change in total controlled emissions from the base year to the projection year.

The costs table is generated only if a cost analysis is requested. It follows the same general format as the emissions table with each line representing a single industrial category (possibly aggregated). The left column lists the industrial category. The middle two column groups provide information for the base year and projection year respectively. The right column group lists the change in costs from the base year to the projection year in absolute terms and in terms of percent change.

The column headings are as follows:

Ind Cat ID	The industrial category ID.
Cost	The total annual control cost ($/year).
Emis Red	The total annual emission reduction (tons/yr) computed as uncontrolled emissions minus controlled emissions.
Cost Eff	The cost effectiveness ($/ton) computed as annual cost divided by annual emission reduction.
Abs Chg	The absolute change in cost between the base year and projection year ($/year).
Prct Chg	The percentage change in cost between the base year and the projection year.

OVERALL EMISSION (AND COST) PROJECTION RESULTS

This output is the final summary of an analysis. It is a single table which provides a summation of all regional tables. Each line of the table represents a single industrial category for all regions in an analysis. An emissions table is always

generated; a companion cost table may be generated if a cost analysis is requested.

The layout and column headings are identical to the regional emission projection results discussed previously.